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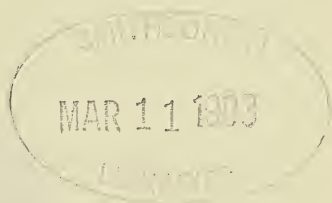
# BOTANICAL SURVEY OF INDIA

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VOLUME I.



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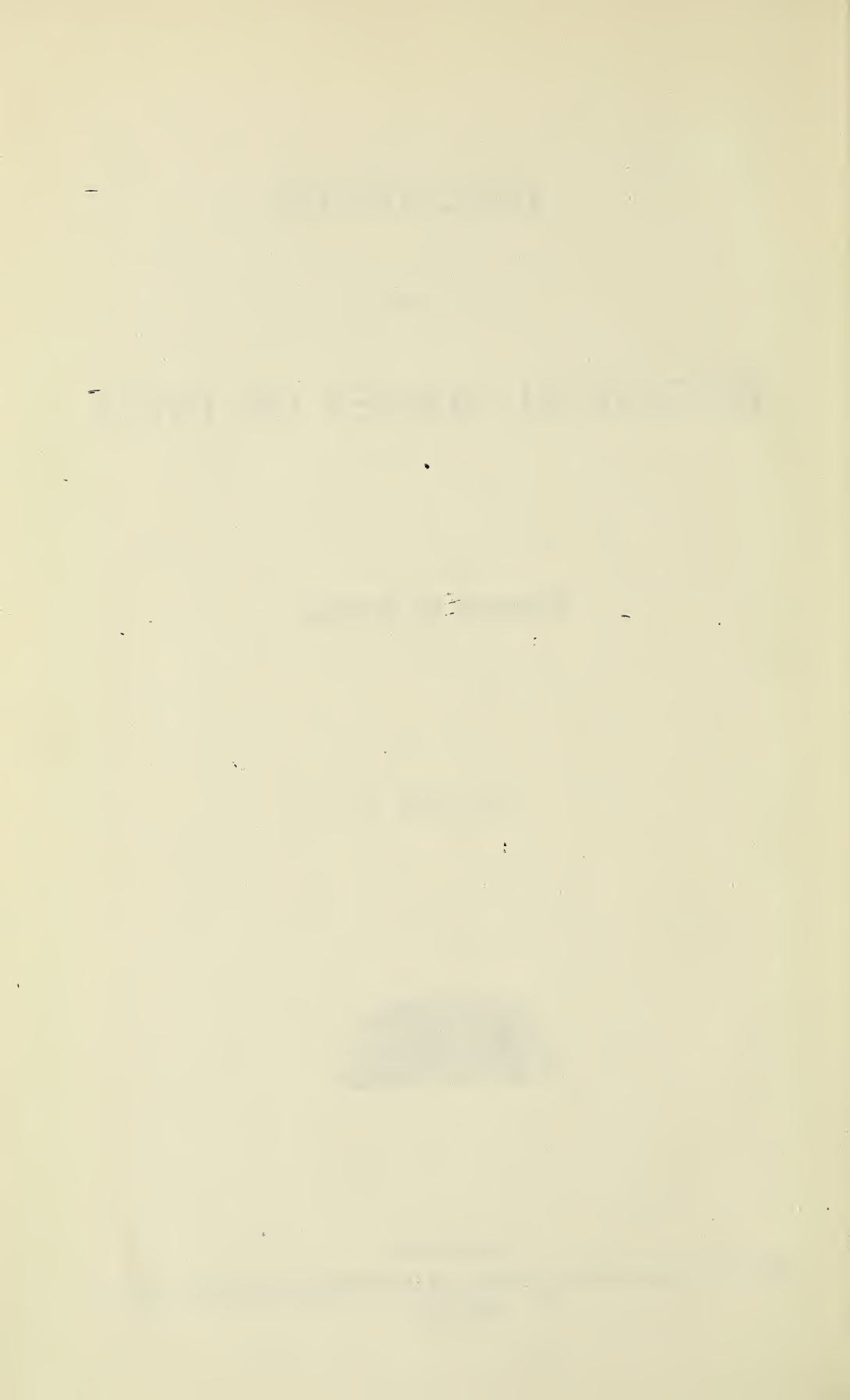
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VOLUME I.



CALCUTTA:  
OFFICE OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1893-1902.



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RECORDS  
OF THE  
BOTANICAL SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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VOLUME I.

No. 1.

REPORT ON A BOTANICAL TOUR IN KASHMIR,

BY

J. F. DUTHIE, B.A., F.L.S.,  
DIRECTOR, BOTANICAL DEPARTMENT, NORTHERN INDIA.



CALCUTTA :  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1893.



## PREFACE.

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THE project for a Botanical Survey of the Indian Empire having now taken shape, it is considered desirable that there should be some special channel through which the results of the Survey may be communicated to those interested in the progress of Botanical Science. It has therefore been decided to issue, under the title of "Records," such reports made by officers of the Survey as shall contain matter of botanical interest or of novelty. These Records will be published. not at fixed intervals, but from time to time as appropriate materials may be received.

growing on the same kind of tree and at about the same elevation. (10,000-11,000 feet). It is published in the Flora of British India under the name of *Arceuthobium minutissimum*. It was afterwards gathered by Mr. Lace in Kunáwar, and I have since seen it, at Gulmarg, in the Sind Valley and in the Gudhai Valley of the Astor District. It is abundant also near Gurais in the Kishenganga Valley.

I arrived at Gulmarg on the 23rd, and spent several days there exploring the vegetation of the neighbourhood, which offers great variety owing to the abundant rainfall, the dense forests encircling the marg and the elevation of the surrounding mountains.

*Baltistán and Gilgit Tour.*—A brief sketch is here given in order to indicate more clearly the route which was followed.

Starting from Gulmarg on the 20th of June the route taken was as follows:—From Baramula by the Jhelum and Sind rivers to Gandarbal, up the Sind Valley *viá* Sonamarg, to Báltal, and over the Zoji La to Dras. From Dras we proceeded in a north-westerly direction up the Marpu *nullah*, and over the Marpu La to Golteri in the Shingo Valley. Descending the Shingo Valley as far as the village of Fransart, we crossed over a high ridge, the water-shed of the Shingo and Shigar rivers, to the village of Shigar. After crossing the Shigar River by a jhula bridge we turned in a northerly direction up the Karpuchu Valley and went over the Bári La to a camping-ground overlooking the north-east corner of the Deosai plains. From here, keeping still towards the north, we crossed over the Shátung La and forded a big stream flowing towards the Deosai plains. About 500 feet above this was another pass which we had to cross in order to reach the head of the Khorbala *nullah*. From here, descending by a very steep and rocky path we entered the Satpur Valley, and passing Satpur Village and Lake arrived at Skardu in the Indus Valley on the 14th July.

From Skardu we went one march up the Indus Valley to a place called Katzura, and from there up the Shigarthang Valley and over the Alampi La to Gudhai on the road from Bandipur to Gilgit. The rest of the journey to Gilgit was made along the new road *viá* Astor and Bunji.

From Gilgit I made a short expedition to the Naltar Valley *viá* Nomal in the Hunza Valley.

Returning from Gilgit on the 20th of August we took the same route as far as Gurikot below Astor. Here leaving the main Gilgit road we kept up the Astor Valley crossing the stream from the Rupal *nullah*, and thence into the Kamri Valley, and over the pass of that name to Gurais in the Kishenganga Valley. After a few

days' halt we proceeded, *via* the Trághal to Bandipur on the Woolar Lake and thence by boat to Srinagar.

I shall now give a rather more detailed account of this journey.

After traversing the Woolar Lake the usual course for boats proceeding to Srinagar is by the Noru Canal, which joins the main Jhelum River a little below the village of Shádipur, so called from the junction of the Sind River with the Jhelum. A large portion of the Woolar Lake during the month of June is a perfect garden of water-lilies and other aquatic flowering plants, including the 4-spined Singhára (*Trapa natans*) which is very abundant here. The water of the Sind is beautifully clear by comparison. This river winds for miles through some fine pasture-land and water-meadows filled with tall handsome sedges, whilst the surface of the water is covered with innumerable flowers of white water-lilies.

The river ceases to be navigable beyond Gandarbal. From Gandarbal the Sind Valley extends some 58 miles up to the Zoji Lá, a pass leading into Baltistán. The total rise is about 6,000 feet.

The lower part of the valley is extensively cultivated, rice being the principal crop. Fruit-trees are also largely grown near the villages, which have an appearance of prosperity. Higher up the valley cultivation becomes more limited, and the villages contain a poorer class of people.

The vegetation of the valley from a botanical point of view is rich and varied. There is plenty of water brought down by numerous snow-fed streams; and the hill-sides, especially such as face the north, are thickly clothed with fine forests. As the elevation increases the sub-montane character of the vegetation gradually gives way to more temperate forms until, after passing the gorge below Sonamarg, a distinctly alpine element is observed, as at Gulmarg, the elevation of which place is about the same.

The village of Sonamarg consists of a few miserable-looking huts uninhabited during the winter months. It boasts, however, of a Post Office and Telegraph Office. After crossing the river at Sonamarg the road passes over undulating pasture ground, and here and there through patches of forest composed chiefly of *Pinus excelsa*, mixed with willow and Himalayan poplar.

The two principal feeders of the Sind River join near Báltal; the larger one from the south rises in the neighbourhood of the famous Amarnath Cave, whilst the other, a small narrow torrent, comes in from the direction of the pass.

Báltal is a little over 9,000 feet. There is no village here; only one or two huts occupied by the dák runners between Kashmir and Leh. On the day following my arrival at Báltal I explored for some

miles the valley to the south leading to Amarnáth. For considerable distances the river is completely covered over with snow. Further up we came to a place where, owing to the absence of snow bridges, it was impossible to proceed further. Many interesting plants were collected in this valley.

The Zoji La is rather a dangerous pass when covered with snow; otherwise there is no difficulty whatever. I crossed over on the 29th June, at which time there was no snow on the road.

The views from the summit looking north and south are striking from their contrast. On the northern side the mountains are bare and rocky, and there is not a tree to be seen in the valley leading to Drás; whereas on the Kashmir side the Sind Valley is beautifully wooded. The different climatal conditions prevailing on the Drás side are indicated by the presence of many Tibetan plants; also by the whistling cry of the marmot. The top of the pass is 11,287 feet. Some interesting plants were found on the ridge to the west of the pass up to 12,000 feet.

After descending the valley for a few miles I made another detour towards the east and collected a variety of specimens near a glacier at about 13,000 feet.

My camp was pitched at Minimarg, 4 miles further down the valley; and many new plants were collected on the way.

Before reaching Minimarg we passed a very promising-looking valley towards the east, called Suknullah, which I explored on the following day, the camp in the meantime having been moved down the valley to Mataiyan. The view looking up towards the pass is very fine. The sides of the valley here are very precipitous, and apparently quite bare of vegetation.

Between Mataiyan and Pandrás the road crosses from the right to the left bank. A tall aromatic fennel-like plant, called "*A'pat Kanphur*" (*Ferula Fæschkeana*), is very abundant in this part of the valley. It is much valued by Kashmiris as a fodder plant, and is cut for winter use. On the Pir Panjál it is called "*Kángwa*." The valley suddenly opens out before reaching Drás, an unimportant-looking place consisting of a few scattered hamlets. There is, however, a small fort here, also a tehsil and Post Office. The elevation is just under 10,000 feet. The surrounding mountains are very bare and rocky. Trees are scarce; only a few willows and poplars are to be seen near the villages. I halted for one day, and left on the 3rd of July with a new set of ponies and coolies.

The road to Leh continues down the valley in an easterly direction.

This is also the ordinary route to Skárdu, but a very hot one during the summer months. The route which I took is a high-level one, and much more interesting for botanical exploration.

After crossing the valley in a north-westerly direction through fields of buck-wheat, *masur* (*Lens esculenta*), etc., the road begins to rise in zig-zags along a very rocky valley almost bare of vegetation for the first few miles. At 12,000 feet the botany becomes more interesting. The white variety of the marsh marigold fringes the sides of the stream; a brilliantly yellow-flowered *Draba* was conspicuous, growing in masses near the top of a pass; and mixed with it was a rare *Anemone* (*A. albana*). The tents were pitched at a place called Pattarkhán Brangsa, between 12,000 and 13,000 feet. There is an enormous rock here which affords good shelter for coolies.

I went over the Marpu Pass on the following day. It is over 15,000 feet, and forms a portion of the watershed between the Drás and the Shingo rivers, both of which flow into the Indus. It is quite an easy pass, but the path is a very stony one, and on this account a little more snow would have been an advantage.

The next camping-ground is at Pattar Dokás, about 2,000 feet below the pass. The stream of this *nullah* flows into the Shingo River, a few miles below the village of Golteri; which was my next halting stage. This village is on the right bank of the river, and is situated on a plateau of moraine debris. The elevation is about 11,000 feet. I stayed here for one day as the botany was interesting, and I had to make arrangements for another set of coolies. The pencil cedar (*Juniperus excelsa*) is plentiful in this valley, but the trees are stunted. The Shingo River rises near the Burzil Pass and flows into the Shigar, one of the tributaries of the Indus.

I left Golteri on the 7th of July, and went down the valley on the left bank to a place called Chamlong. The river is crossed by a small rope bridge just below Golteri; close by here and alongside the river is the village polo-ground. The path keeps near the river all the way, and is very rocky in places. One great feature of this valley is the abundance of a very floriferous sweet-scented rose (*R. Webbiana*). The flowers vary from deep pink to white. The people here call it *sermang*. Many other interesting botanical specimens were gathered. A wild-looking valley, called the Shwáran *nullah*, has to be crossed by a rope bridge before reaching Chamlong.

On the following day we continued down the river to the village of Fransart by an extremely rocky and rather difficult track, and some parts of it must be quite impassable when the river is at all high. There is an alternative and longer route at a much higher level. The elevation of Fransart is about 10,000 feet. There is a large extent of

cultivated ground in this part of the valley, including many fields of barley. After changing coolies we had before us a steep ascent up to 12,000 feet in order to cross over into the Shigar Valley. The small village of Shigar is prettily situated at some distance above the river. The valley just here is rather wide, and some side valleys open into it on the opposite side, where the mountain scenery is very grand. Their lower slopes are clothed with forest, consisting chiefly of *Pinus excelsa* and *Juniperus excelsa*. Mosquitos are very troublesome here at about sunset, and at higher elevations up to 14,000 feet they are even worse. It must of course belong to a different species from that of the plains of India. The wild flowers here are very beautiful and interesting. On the following day we had to cross the Shigar over rather a difficult rope bridge, 112 yards long. The loads were taken over by a few experienced men. The water is very deep here, and so quiet that one wonders why they don't use ferry boats instead of this twig bridge, which has to be constantly repaired. After seeing all the baggage safely over we took the path leading to the entrance of the Karpuchu Valley, where there is a village called Matral, and a fort or tower built of alternate layers of wood and stone. From here the road winds up the valley gradually ascending through a forest of pine and juniper to our next camping-ground at about 12,000 feet. This place is called Karpuchu, and consists, as far as I could see, of a single shepherd's hut. On the following day we made another march further up the valley to about 14,000 feet. Heavy rain came on before the camp could be pitched, and an uncomfortable night was spent under wet canvas which was frozen hard before the morning. We had not far to go the next morning (July 11th) before reaching the summit of the Bári Lái, about 15,000 feet. There are several small tarns on the further side. A good deal of snow was lying about, and vegetation was scanty, consisting chiefly of Primulas, Sedums, and Saxifrages. A very curious plant called Galgal is abundant here. It is a species of *Saussurea* (*S. obvallata*). The pale yellow bracts are very large and loosely envelope the composite heads of flowers, which are strongly scented. The stillness at these high elevations is always very striking. After descending, however, for a short distance on the other side, the air was filled with the shrill cries of the marmots. Our next camping-ground was close to a big mass of rock at about 14,000 feet, and looking down the valley towards the north-west one could see a small portion of the Deosai Plains.

Coolies and all were glad to leave this bleak and inhospitable spot, but we had a hard day before us, with two passes to get over, and a long steep descent into the Satpur Valley.

The first pass we came to is called the Shátung Lá, about 13,500 feet. There was a good deal of snow here in a melting state, which made walking rather difficult. The descent is into a valley watered by a stream called the Tikatsichu. From here the path ascends to the pass leading into the Kharbula *nullah*. There is a small lake at the summit of this pass, and a good view of the Deosai Plains can be seen from here. The path descends steeply from here into the Satpur *nullah*, at the head of which is the camping ground called Ronishikar or Jalna Bránsa. It occupies a small piece of flat ground on the spur of a mountain, and the elevation is about 12,500 feet. Looking down the valley a view is obtained of some distant mountains on the further side of the Indus.

The floor of my tent was carpeted with edelweiss, *Anemone albana*, and other interesting specimens.

The path down this valley is very steep and very stony. My intention was to have gone on to Skárdu from here, but finding the botany so interesting I decided to halt halfway near the village of Satpur. Several bushes of a handsome *Spiraea* (*S. hypericifolia*) were met with on the way down. This species is not included in the Flora of British India. My friend Captain Hunter Weston, R.E., brought me flowering specimens of this shrub discovered by him in Baltistán three years ago. The plant, however, is well known to the natives who call it "*Saber*." The wood is hard and the bark is of a reddish-brown colour and smooth. Native shikáris from Kashmir nearly always take back with them a bundle of sticks cut from this shrub. Many other rare plants were also collected.

There is a good deal of cultivation in the neighbourhood of Satpur. The fields which have been skilfully terraced contained fine crops, especially of wheat and barley, nearly ready for the harvest. Other crops are peas, called here *kukan*, beans or *bakla*, the Balti name of which is *bararak*, and turnips (*gonglu*); wheat is called *kanak*, and barley is *nas*. The general name for all kinds of grasses is *kash*. Several kinds of fruit-trees are also grown here, such as walnuts, mulberries, and apricots.

After leaving Satpur the road follows the bed of the river, and then over grassy and more or less marshy land until the lake is reached. The path then ascends and is carried along the east side of the valley at some distance above the lake. The lake occupies the whole width of the valley, which is about a mile across, and its length is nearly two miles. It contains fish. We passed a curious old wall which extends down the side of the mountain and ends in a fort overlooking the lake. After passing the lake the path (a very bad one) keeps more or less by the river until it suddenly emerges

into the Indus Valley immediately opposite Skárdú. I halted two days here, and my time was fully occupied replying to the numerous letters which had been awaiting my arrival for many days, and attending to the large collection of specimens recently collected.

Captain Townsend, of the Central India Horse, was here in command of some Kashmir Imperial Service Troops, and was the only Englishman in this place when I arrived. I am much indebted to him for his kind assistance in various ways, as well as for his hospitality. The Tehsildar, who is practically the governor of Skardu, was also most obliging. A great deal might be written regarding the history of this interesting place, also of the scenery, which is very striking. All cultivation is carried on by means of irrigation, the channels for which extend for miles from the sources of supply. The numerous villages which are scattered throughout the valley are conspicuous by their settings of vivid green patches in the midst of a sandy desert. A very superior kind of apricot is to be obtained from some of the gardens. When ripe it is extremely juicy, more like a plum in this respect, and the flavour is delicious. It is called *chilu*, but is very different from the ordinary hill apricot met with in this country, the flesh of which is more or less of a firm consistency. Walnut trees are plentiful, also some superior kinds of mulberry.

I left Skárdú on the 17th of July for Katzura, a small village about 16 miles up the valley towards Rondu. It lies on the left bank of the Indus, close to the large torrent which comes down roaring and foaming out of the Shigarthang Valley. This is a very trying march owing to the long stretches of sand which throw off an immense amount of heat during the day. For the first few miles out of Skardu the path is shaded by an avenue of poplars, but suddenly this avenue abruptly terminates at the edge of a sandy desert. One of the villages I passed through was inhabited by Kashmiris. I found a man manuring his tobacco field with freshly-cut plants of a kind of thistle (*Cnicus arvensis*), which he called *kanish*. The tobacco was of the coarse round-leaved variety (*Nicotiana rustica*).

I rested for a short time at the village of Hoto, and was much refreshed by some apricots which were presented to me. The wheat here was much rusted. This village is liable to the encroachment of the Indus as well as to inundations of blown sand. After this the road begins to rise gradually towards Katzura. A pretty lake is passed, and soon after that the Shigarthang Stream is crossed by a bridge. A few hundred yards further on is the village surrounded by fruit-trees (walnuts, apricots, and mulberries). On arrival I was presented with a basket of excellent large round black mulberries. This variety is called "*kachilosa*" or "*sháhtut*." Wheat,

beans, and tobacco are cultivated here in small patches. The elevation of this place is about 8,000 feet.

The next day's march was to Shigarthang, about 16 miles up the Shigarthang Valley. Soon after entering this valley the road takes a sudden turn to the south. The ascent is easy at first. The village of Tzok with its fruit-trees and grassy meadows is prettily situated in an open part of the valley. From here the road turns round to the north and is carried by a bridge to the left bank. The scenery now becomes very wild. Bare precipitous rocks hem in the valley on all sides and the road becomes steep and stony. Vegetation is very scanty, but what there is is interesting. The *Saber* (*Spiraea hypericifolia*) was found again. A kind of ash (*Fraxinus xanthoxyloides*) was plentiful at about 9,000 feet in fruit, also *Juniperus excelsa*. After this the road takes a sudden turn to the west, and ascends steeply between innumerable boulders of an enormous size, severed from a mountain on the left, and extending down to the river, where they help to form a series of beautiful waterfalls and cascades. Above this is a small village, near which I came across some of the tiniest full-grown cattle I have ever seen. They were covered with long black hair, and looked more like bears.

At Shigarthang the main valley takes a sharp turn to the west towards the Alampi Lá and the Banok Lá. Two other valleys open out into this bend of the Shigarthang Valley, on the east the Dora Lumba from the direction of the Burji Lá, and the Munda Lamba from the south. The village is on the right bank of the main stream and is situated on a high plateau composed of moraine debris. The elevation is over 10,000 feet.

The people of this place are a wild-looking lot, but cheerful and full of humour. Their head gear is of the Hunza pattern, *viz.*, a long bag with the edges rolled in until it forms a cap. The men, whose lot it was to carry the loads on the next march, appeared in the morning with their caps decorated with the crimson flowers of *Rosa Webbiana*, shouting and chattering in a language which none of my servants could understand. As these men had to accompany me over the Alampi Lá and for some distance down towards Astor, arrangements had to be made for their rations, and I was unable to make a very early start. We made a short march therefore to a place, called Rimo Chagma (or Ringmo Chami), close to the river and between 12,000 and 13,000 feet, and on the following day started with the intention of going over the pass.

By the time, however, we had reached the foot of the first serious climb towards the pass, it was too late in the day to attempt the long and difficult journey across the snow. The weather was perfect, and

without a cloud in the sky. The elevation was about 13,000 feet. In the evening I went up for a few miles towards the head of the main valley and collected some plants.

Early the next morning (July 21st) we made for the pass, beginning with a steep more or less grassy ascent up to 14,500 feet. Beyond this is a wide *corrie* surrounded by an amphitheatre of precipices, and with a lake at the bottom and patches of snow all about. From here turning to the west we had another stiff climb before us, with a good deal of snow to cross at a disagreeable angle, for the snow was frozen hard and steps had to be cut. Having reached the top of this slope we found ourselves in another hollow basin. Here was a much larger lake all frozen over. There was nothing now to be seen but rocks and ice and snow.

After skirting the shores of this lake we reached the foot of the final climb, a steep staircase of rock, and at last arrived at the summit of the pass, the elevation of which is 15,200 feet. The descent on the western side is into a valley which was covered with snow for 2 or 3 miles. The upper part of the snow slope was very steep and hard, and steps had to be cut for a considerable distance. We got off the snow at about 1,000 feet below the summit of the pass, and rested for a short time by some big boulders. From here the finest view of Nanga Parbat is obtained, and it was seen to perfection on this day.

Looking about amongst the boulders for botanical specimens I came across some human bones, and beside them a few pieces of cloth, also a portion of a gun-stock. They were all together in a sort of small cave formed by an overhanging boulder, which may have afforded the unlucky traveller temporary shelter, but which eventually became his tomb.

We had to go down the valley to about 12,000 feet before we could find a suitable camping-ground. The botany was most interesting, and many new plants were discovered. The whole way down to Gudhai on the Gilgit Road the scenery in this valley is very fine. It is richly wooded in parts, the chief trees being *Pinus excelsa*, *Juniperus excelsa*, and willows. We passed a few small villages, the most important of which is Bobin; its elevation is a little over 11,000 feet. Some fine *nullahs* open into this valley on either side. At about 10,000 feet Karbe Village is passed. Near here I came across a number of Commissariat coolies, mostly Punjabis, cutting grass for the Gilgit Transport animals.

From here there is rather a steep descent to the Burzil Valley. The two rivers join close to Gudhai, the elevation of which is about 9,000 feet.

We are now on the main Gilgit road, a few miles from Naugáon, where I dismissed my Shigarthang coolies, and got a fresh set to take my loads on to Astor the next day.

On arriving at Naugáon I found the entire population either playing, or assisting as spectators, at an exciting game of polo. The flat roof of a house served as grandstand, and here the village band played a variety of tunes.

The next day's march was to Astor. The road for the first few miles is very rough and dusty. This is really a piece of the old road, the new portion, which is being carried at a higher level, not then being open for traffic. After crossing the Burzil Stream and the Astor River, the road ascends to Gurikot where there is a good deal of cultivation and many groves of fruit-trees. From here the new road leads by easy gradients to Astor. The edible pine (*Pinus Gerardiana*) is common in this portion of the valley, the elevation being about 8,000 feet. The local name is *Garol*. *Juniperus excelsa* is also abundant here, and is called *chili*.

The scenery of this portion of the valley is remarkable. The villages on either side are perched on the slopes of an enormous moraine, through which the river has cut a deep channel with high precipitous cliffs of moraine debris on either side. Astor itself is high above the river.

The Hollyhock (*Althæa rosea*) with pure white or mauve-coloured flowers is abundant here along the edges of cultivated ground. It is not indigenous, and was probably introduced at some time or other along with the large white-flowering Iris, for planting over graves.

I remained at Astor for a day, and left on the 26th July for Daskin. After passing the fort the road descends to Harcho, and then ascends to Daskin, keeping high above the river, Daskin being considerably higher than Astor.

The sides of the Astor Valley look almost completely bare of vegetation. There are, however, many juniper trees scattered over the rocky hill-sides which at a distance give the grey colour of the rocks a speckled appearance. Some interesting plants are to be found in the rock-crevices, and in the more shady nooks. At elevations above 10,000 feet the climate is cool and moist, and the vegetation is correspondingly luxuriant. These conditions prevail throughout this part of the country, and up to and beyond Gilgit. Nearly every *nullah* which opens into these hot, dry and comparatively low valleys afford views of forests and green pastures extending up to the snow line.

Beyond Daskin the road still ascending passes through

the lower portion of one of these forests, which extend more or less all along the high-level ridges from Astor to Doian. This proved to be one of the most interesting bits of botanical ground met with during the whole of my tour. The principal trees are *Pinus excelsa*, *Pinus Gerardiana*, and the Pencil cedar. Streams of clear water cross the road at intervals, and many rare plants may here be found. After passing through this forest the road again enters the arid waterless tract, until Doian is reached, close to which place the same kind of forest extends.

There is a small bungalow at Doian belonging to Messrs. Spedding & Co., the road contractors. As rain came on in the afternoon, I was glad to avail myself of it, and so save my tents from getting wet. There is a splendid view from here in clear weather looking down into the Indus Valley and across to some very high snowy peaks beyond.

It rained steadily all night and the next morning, and remained cloudy during the rest of the day. This was an advantage, as the next march down to Rámghát is a very hot and trying one on a sunny day. The old route over the Hattu Pir must however have been very much worse.

At Rámghát there is a bridge over the Astor River, which rushes through the gorge here at a furious pace. This spot is known locally by the name Shaitán Nára. The camping-ground is about a mile beyond this, on the left bank of the Dachkat or Misikin Stream. This torrent, like many other glacier streams, rises and falls at different times of the day, and during the summer months it is quite unfordable towards evening.

From this place there is a good road mostly over a stony plateau to Bunji, the elevation of which is under 5,000 feet. This used to be a much more important place until the great flood of 1841 destroyed it and laid waste a large extent of cultivated land. There is a very good bungalow here and a garden of fruit-trees in which I pitched my camp.

Captain Yeilding, D.S.O., arrived here that evening from Srinagar, and I had the pleasure of his company as far as Gilgit. The distance is nearly 40 miles by the new road. It is certainly a journey to be undertaken as quickly as possible, for the whole valley is extremely hot during the day time, there being no shade whatever until you reach the village of Minawar, about 8 miles from Gilgit. Finding that my coolies were a long way behind, I was obliged to halt about 6 miles short of this place on a gravelly plain near the river. As some portions of the new road between this-

place and Minawar were not then open for traffic, we had some difficulty with the loads, especially at certain spots where the debris from the new road was being shot down on to the only other possible track. I found Captain Yielding at Minawar early the next morning, and we rode on from there to Gilgit.

The views of the snowy peaks towards the north-east were wonderfully fine, one of them, Rakapushi, over 25,000 feet standing out clear against the blue sky. The first sight of Gilgit from the Jutial Ridge is very striking, as you look down upon the wide expanse of orchards and cultivated fields, the colours of which appeared so vivid by contrast with the surrounding bare and dazzling rocks.

I stayed at Gilgit for one day, and left early on the morning of the 2nd of August for Nomal in the Hunza Valley. After crossing the bridge over the Gilgit River the road follows the left bank of that river in an easterly direction for about 3 miles, and then turns round towards the north up the Hunza Valley. The distance from Gilgit to Nomal by this road is about 16 miles. This is a very hot and trying march in summer, as there is not a particle of shade except at one place, about halfway, where a landslip has brought down some big boulders. There is no water either, except that of the river, which at this time of the year is quite muddy and looks more like a mixture of ink and milk. After entering the Hunza Valley the road traverses for some miles an undulating sandy tract covered in parts by a large bushy species of *Ephedra* (*E. intermedia*). After passing the *halfway boulders* the road is carried for a considerable distance along the side of a precipitous hill, descending again to more level ground before reaching Nomal. The elevation of this place is 5,500 feet.

On the following morning I left the Hunza road, and went up the Naltar Valley towards the north-west. For the first few miles the valley is confined within bare precipitous rocks. Some interesting specimens were gathered near the river, which has to be crossed by bridges four times before reaching the village of Naltar, the elevation of which is about 6,500 feet. There is plenty of vegetation here, and some good crops were seen of wheat, barley, *kangni* (locally called *pirpit*) and *chena*. Walnuts, apples, and vines are also grown here.

After resting for a little while I continued up the path for a few miles, and found a capital camping ground in a forest of silver fir at an elevation of about 9,000 feet. Beyond this the valley opens out, and is clothed with fine forests containing silver fir, juniper, and blue

pine (*Pinus excelsa*). On the slopes facing the north-east these forests extend to a considerable elevation mixed with birch and willow. There is a path leading up to the head of this valley to a pass which separates it from the Chaprot Valley. Numerous glacier-fed streams come down into this valley from either side. As I had only two days to spare for botanical exploration, I found it difficult to decide as to which route to take on each day, there being so much promising-looking ground in every direction. My expectations were fulfilled on the first day, and the cooly-load of drying paper which I took with me was very soon used up, and the collecting box crammed full of rare specimens long before I had reached any great elevation. In fact, owing to the richness of the vegetation and the difficult nature of the ground, I managed to get up only to about 2,000 feet above my camp.

I explored another side *nullah* on the following day (August 5th), and found this one even more difficult. In one place I had to circumvent a big waterfall, and by the time I had got round to the top of it evening was coming on and rain too. This waterfall was rather a remarkable one on account of the rocks of all sizes which were constantly being carried over the fall. My attention was first attracted by the peculiar sound produced by the rattling of the stones.

I much regretted being obliged to leave this beautiful valley, which would require several days for its proper exploration. There was a good deal of rain in the night, and all the streams were much swollen when I left for Nomal the next morning. The river too was very high, and the two bridges near the village of Naltar looked very insecure when we passed over them, and one or both must have collapsed very soon afterwards.

On reaching Nomal I was told that the Gilgit bridge had been carried away, and that the only communication with Gilgit was by the rope bridge. The damage done by swollen rivers during these few days appears to have been caused by a wave of warm air acting over a large extent of country; for, on my way back to Kashmir, I saw in many places signs of the havoc done to roads, bridges, and village water-courses, all of which happened at about the same time. At Bunji one of those curious mud streams came down and destroyed the water-courses; and at Rámghát the Dachkat torrent gave much trouble. At Harcho, in the Astor Valley, a bridge was carried away and in the Kamri Valley a good deal of damage was done.

In order to escape the heat of the Hunza Valley during the day, I left Nomal at about 2 A.M. and reached Gilgit in time for breakfast. The rope bridge was a decidedly disagreeable obstacle at the end of a long and tiring march. In addition to the sense of insecurity which

a man with a fairly good head for giddy heights need not be ashamed of, and with an inky black river rushing beneath him at a racing pace, there is a considerable amount of physical exertion required.

I remained at Gilgit for two days, and I gladly take this opportunity of expressing my obligations to Mr. Robertson, the Officiating British Agent, for his kindness and hospitality. I had the pleasure also of making the acquaintance of Surgeon-Captain Roberts, the Medical Officer attached to the Agency. His knowledge of gardening does justice to the capabilities of the climate in the production of good vegetables and fruit. He also takes an interest in botany, and through his kindness I have since received from him a very interesting set of specimens collected in the neighbourhood of Gilgit. I am also indebted to Captain Younghusband, not only for many acts of kindness during my stay at Gilgit, but also for a very interesting collection of plants gathered by him during his memorable journey across the Pamirs.

In a dry and rocky country like Gilgit there must always be considerable difficulty in arranging for a continuous supply of fodder for any large number of transport animals. Along certain sections of the Gilgit road beyond the Burzil Pass, the local supply being practically nil, a good deal of expense is necessarily incurred by carriage.

With the exception of the village sites, where cultivation is carried on by means of irrigation channels, the hill slopes on either side of the road, in consequence of the very small amount of annual rainfall, are extremely bare of vegetation, and what there is is coarse and unpalatable. The most abundant plant on these hill-sides is a species of worm-wood (*Artemisia maritima*), which mules and donkeys will eat for lack of anything better. I have seen no record of any species of *Artemisia*, several of which are known to occur in India and along the north-west frontier, as affording fodder for ponies and mules. But two Himalayan species, *vis.*, *A. parviflora* and *A. sacrorum*, have been mentioned as being eaten by sheep and goats.

A certain amount of grass and weed herbage is to be found along the edges of irrigated village fields, which even, were it not required by the villagers for their own animals, would prove to be but a small contribution.

Large quantities of grass and weeds of sorts had to be procured last summer from the nearest *margs* lying within the more elevated moist zone, and accessible from the main valley by certain *nullahs*. The grasses and other plants collected from these localities should afford excellent fodder in the form of hay. The great drawback to this source of supply is the expense of cutting and the carriage.

The section between Bunji and Gilgit offers at present the greatest difficulties, as there are so few villages in the neighbourhood. There are, however, several abandoned village sites, where, I am informed, attempts have been made, after repairing the old water-channels, to grow crops. In a dry rocky or sandy country it is wonderful how luxuriant the growth of vegetation becomes by irrigation alone. Every opportunity should therefore be taken to utilize any surplus village water, and as far as possible to repair and make use of the old water-channels of the abandoned villages. By the use of manure, of which there should be an ample supply, considering the large number of animals daily passing up and down the road, a considerable quantity of green stuff might be rendered available.

I have reason to believe that large quantities of valuable fodder might be prepared locally in the form of silage. Many nutritious plants are rejected by animals by reason of the thorns or bristles with which they are protected. In a comparatively rainless and rocky country like Gilgit this is the usual character of the spontaneous vegetation. The same plants, which only camels or donkeys will touch in a fresh state, would, after being siloed, become palatable and wholesome food for ponies as well as for mules.

I left Gilgit in the afternoon of the 10th of August for Mináwar, and on the following day rode to Domel in the Indus Valley, close to the flying bridge erected by Captain Aylmer, R.E. The views from here of Nanga Parbat and Rakapushí are exceedingly fine, and I was fortunate in being able to see these wonderful mountains by moonlight as well as at sunset and sunrise. I rode into Bunji the next morning and spent the rest of the day there, and collected some plants in the evening.

I rode to Rámghát on the following morning (13th August) and walked from there to Doain, a steep ascent of 4 000 feet, and on the following day explored the ridge above Doian up to 12,00-13,000 feet. There were fine views looking over into the Leta and Buldár nullahs and down the Indus Valley towards Chilás. A large number of most interesting plants were collected in the forest above Doian and on the open parts higher up, the most important discovery being that of *Pyrola secunda*, a species new to the flora of British India.

On the 15th I got as far as Harcho, and arrived at Astor on the following day. I had to stay here four days to try and recruit my health, which had commenced to give way at Gilgit owing to extremes of temperature and over-exertion.

Mr. Blaker, of the firm of Messrs. Spedding, Mitchell & Co., had a permanent camp here, and he gave me much assistance and was most kind and hospitable.

I left Astor on the 21st, intending to go as far as Chugam below Rattu in the Kamri Valley, but was detained a short way below where the Rupal Stream joins the Astor River. A bridge had given way and was being repaired. There is a grand view from here looking up towards Nanga Parbat. Some interesting specimens were collected near the banks of the river.

The next day I made an attempt to reach the village of Társhing in the Rupal Valley, and at the foot of one of the big glaciers below Nanga Parbat. I managed to get up the valley about halfway, when I unfortunately became ill again and I had to return. The botany near the glacier must be extremely interesting, and I still hope I may be able some day to explore this locality.

I encamped that night near the village of Rattu in the Kamri Valley, elevation 6,800 feet. The valley here is open, and with fine views of Nanga Parbat to the north and the Mir Málik Valley which joins the Kamri Valley a few miles further up towards the south-west. Beyond the village there are broad stretches of undulating pasture land, known as the Rattu plains. The whole valley, in fact, is beautifully clothed with grass, and there are some fine patches of forest, especially on the sides of the *nullahs* coming down to the left bank of the river.

I went on to Gumin the next day, a very beautiful march, and excellent for botany, elevation about 9,000 feet, and on the 24th arrived at camping-ground of Kálapáni the elevation of which is about 10,600 feet.

On the following day, leaving my camp here, I started off in the early morning to explore one of the *nullahs* on the western side of the valley. I managed to get up to an elevation of 12,500 feet where a large number of interesting specimens were obtained.

On the 26th I went over the pass (about 13,000 feet) and descended about 3,000 feet on the other side to the village of Gurikot in the Burzil Valley. I collected some interesting plants on the pass. One very striking feature in the vegetation of the upper part of the Kamri Valley is the abundant growth of a most remarkable cruciferous plant called *Megacarpæa polyandra*. It has thick hollow stems upwards of 4 or 5 feet high. It grows in open grassy places, and at some little distance these tall herbaceous plants look very like young trees. The local name is *chach*; and the young leaves are used as *ág* or spinach. It is also found on the Pir Panjal Range, where it is called *chattarhák*, or *chatri*.

I marched to Gurais the next day (27th), about 13 miles of very pretty road along the banks of the Burzil Stream, which joins

the Kishenganga about one mile above Gurais. I had to stay here and rest for a few days; and was getting back my strength when I unfortunately met with an accident resulting in a broken rib. This of course interfered a good deal with further botanical exploration. I had with me, however, an experienced collector who was on the look out for anything new.

The poisonous grass (*Stipa sibirica*) is abundant on the wooded slopes of the Gurais Valley.

I have reason to believe that the results of this tour will prove to be a valuable contribution to our knowledge of the botany of Balistán and Gilgit. A complete set of the specimens has been prepared for the Saharanpur Herbarium; and two other sets have been distributed, one to the Royal Herbarium at Kew and the other to Dr. King at Calcutta. The whole of the mosses, of which a large collection was made, have been sent to Dr. Brotherus at Helsingfors in Finland for determination, also a complete set of the grasses to Dr. Hackel in Austria.

The remaining sets will be distributed next cold weather to various institutions in Europe, and elsewhere by way of exchange.

J. F. DUTHIE,  
*Director, Botanical Department,*  
*Northern India,*

SAHARANPUR, }  
*The 10th June 1893.* }

RECORDS  
OF THE  
BOTANICAL SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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VOLUME I.

No. 2.

REPORT ON A BOTANICAL TOUR IN SIKKIM,

BY

G. A. GAMMIE.



CALCUTTA :  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1894.



REPORT  
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A BOTANICAL TOUR IN SIKKIM,  
1892.

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I departed to collect botanical specimens in Sikkim and on its frontiers on the 6th June 1892. As Mr. White, the Political Agent, informed me that he would probably be at liberty to accompany me on a journey to the little known district of Lhonak, I arranged to meet him at Guntok in about six weeks' time, when we should make the necessary arrangements for our travelling together. To my regret the exigencies of his appointment prevented him from carrying out his intention, and I was obliged to abandon the idea of going alone to Lhonak, as Mr. White considered it inadvisable on my part to attempt it while important negotiations concerning the frontier were pending with the Tibetans.

He kindly forwarded to me parwanas written in Tibetan and addressed generally to the headmen of villages, ordering them to render me whatever assistance I required; but at the same time he wisely advised me not to depend on procuring carriers or supplies from the inhabitants. His passports were of the utmost value to me on the rare occasions I had to avail myself of assistance from the villagers, a service these indolent people would have been loath to afford me had I not been supported by such indisputable authority. As I had no hope of procuring supplies in the country, I made thorough arrangements for food sufficient for all to be sent at intervals to different stations, regulating my movements in accordance with the plans laid down, thus, at all times, avoiding a possible scantiness of rations, which would have disheartened my men and caused their desertion, a most undesirable contingency.

The slothful and improvident habits of the inhabitants prevent them from growing more grain than is actually necessary for their bare subsistence, a condition of affairs concomitant with their lack of mercantile enterprise, which is probably due to their isolation from the outer and more civilized world.

Being thrown on my resources, and having permission from Mr. White to travel in any part of the country, excepting Lhonak and

Cholamoo, I decided to devote the remainder of the allotted time to exploring the Lachung Valley with its ramifications, the Lachen Valley and the Chola Range from Tumloong to the Zeylap La, from whence I could return to Darjeeling by the Gnatong road.

In anticipation of the meeting with Mr. White, I considered that the first month of deputation would be most usefully spent in traversing the Singalelah Range to Kinchinjunga, from which I could march to Guntok by way of Yoksun.

As I was requested to confine my attention as much as possible to the collection and observation of temperate and alpine vegetation, that of low elevations being already well understood, I must omit anything but casual mention of the tract between Yoksun and Tumlong, and also the valley of the Teesta to the junction of the Lachen and Lachung. This restriction divides my narrative into three parts—the first dealing with the vegetation of the exceedingly moist mountains forming the western boundary of Sikkim, the second with that of the temperate and drier territory north of the junction of the Lachen and Lachung, and the third with that of the Chola Range.

**First Tour.** Journey along the Singalelah Range to the tracts on the southern flank of Kinchinjunga, and the march across the valleys of the Ranjit and Teesta to Tumlong.

This excursion lasted from the 7th June to the 7th July. The rainy monsoon broke with almost unparalleled severity on the day of my departure, and the most interesting portion of the journey, namely, that at high elevations, was accomplished through incessant fogs and storms of wind and rain. I thus enjoyed few opportunities of viewing the surrounding scenery, and had perforce to confine my observations to the vegetation within access to practicable paths.

The Singalelah Range is an elevated mountain mass, springing from the face of Kinchinjunga, and extending southwards to the plains of India. Owing to the facilities of travelling afforded by the Nepal frontier road to Phalut, the range so far is much frequented by general travellers, and is in consequence too well explored to induce one to linger on the way in search of novelties. Some Yew trees (*Taxus baccata*) grow close to the road beyond Tonglu, and *Abies Webbiana* is first seen on the last ridge between Tonglu and Sandakphu, from whence onwards it exists in profusion up to 13,000 feet in elevation, covering mountain sides with dense and sombre forests. There are trees of *Tsuga Brunoniana* below Phalut, and *Juniperus pseudo-sabina* abounds near the path to Cheabhanjan, but the other species of Conifers, so characteristic of drier

Sikkim, are altogether absent. Above 11,000 feet the most notable plants are Aconites and *Meconopsis Wallichii*, and a few species each of the genera *Ranunculus*, *Anemone*, *Potentilla*, *Primula*, etc. *Fragaria Daltoniana* occurs here and there, bearing narrow oblong fruits, reminding one of small strawberries and resembling them in flavour. The road from Sandakphu to Phalut passes through a forest of *Abies Webbiiana*, associated with *Pyrus foliolosa*, *Betula utilis*, *Acer caudatum* and *Prunus rufa*, etc., underneath which are thickets of various Rhododendrons and two species of bamboo. One of the latter is *Arunainaria spathiflora* which flowered two years ago, a fact attested by the dead culms still bearing the withered spathe-like sheaths of the inflorescence. Its average height is 10 to 12 feet. The other is what Mr. Gamble named *A. Gammieana* from specimens of the foliage only; but, having since examined flowers, he has discovered it to be *A. racemosa*, Munro, a plant which, although so abundant round Darjeeling as to be almost exclusively used as fodder for ponies, has never been known to flower there. The Phalut plant, which differs so much in size and appearance, having reddish stems with an average height of 3 feet, may of course owe its diminutive size to the more rigorous climate of higher levels preventing its attainment to a normal growth. These two bamboos, the most Alpine species in Sikkim, grow in impenetrable scrubs in the same spongy soil which affords support to Rhododendrons and Pines.

On the slopes immediately below the summit of Phalut arboreal vegetation is scanty and confined to sheltered ravines. The ground is everywhere covered with a sward of herbaceous plants. *Anemone rivularis* with blue and white flowers predominates. *Primula rotundifolia* and *P. sikkimensis* (the latter affecting marshy situations in company with *Calathodes palmata*) are common. *Meconopsis Wallichii* is extremely abundant. The Bhutias eat the young stems of this plant, and the shoots of a *Polygonatum* are much esteemed by the Gurung shepherds. The young shoots of bamboos are cooked and eaten. *Rheum acuminatum* is prevalent throughout the whole of Alpine Sikkim, but is not utilized as food. *Allium Wallichii*, which is equally abundant, is consumed largely, sharing with the common onion the reputation of being an efficacious antidote against the physical discomforts experienced by men and animals at high elevations.

From Cheabhanjan onwards to Kinchinjunga, the only available path is that used by the shepherds, who pasture their flocks along the whole range during summer. For many miles this track follows the contour of the spur's crest, so that every day's march comprises many descents and ascents. As might be inferred from

the proximity of the path to the ridge, streams supplying a sufficiency of water for our camp were few and far between, often necessitating long marches to obtain our two chief *desiderata*—a space large enough to contain our tents, and water for cooking. At the end of the first day we found such a place at Ewanangi, a halting stage for shepherds. Its elevation by B. P. thermometer was 11,174 feet. The camping ground was covered with young plants of the formidable *Cnicus eriophoroides*, a large thistle. At the commencement of this march we struck the Islumbo Pass, and continued in a northerly direction. The path runs through woods of *Rhododendron arboreum*, *R. cinnabarinum*, *R. Falconeri*, *R. barbatum*, and *R. Hodgsoni*, *Acer caudatum*, *Betula utilis*, *Pieris ovalifolia*, *Juniperus pseudo-sabina*, *Abies Webbiana*, *Prunus rufa*, *Arundinaria spathiflora*, etc. These trees grow so densely that very few herbaceous plants exist beneath them. *Saxifraga ligulata*, a few species of *Polygonum*, Ferns of two species, and several species of *Potentilla* being most in evidence. A variety of beautiful mosses grow on the rocks. On open knolls the soil is carpeted with *Gaultheria nummularia*, and the heather-like *Cassiope fastigiata*.

The following day's march was from Ewanangi to Megu. Two Gentians become common about 12,000 feet. One, *Gentianna stylophora*, with large, terminal, greenish, lily-like flowers, the other *Swertia Hookeri*, conspicuous by its brown leaves and inflorescence growing together in whorls on a stem often six feet high. A white and pink *Primula* is common. *Rhododendron Anthopogon* is abundant. Its fragrant leaves are largely collected and burned as incense in Buddhist temples. Small trees are represented by the species of *Rhododendron* formerly enumerated, by *Pyrus foliolosa*, *Prunus rufa*, and the bushy variety of *Juniperus recurva*, which forms excessively close thickets. *Spiræa bella* and *Pyrus rhamnoides* grow in open situations. *Clematis montana* with large white flowers climbs over bushes and at once arrests attention. A succession of steep ascents and descents where we first saw plants of *Meconopsis simplicifolia* in flower nestling under Berberry bushes, was followed by a comparatively level path running over the rocks of a glacial deposit, at the end of which lay the large and grassy flat of Megu, the elevation of which by B. P. thermometer was 12,767 feet. Its bright green surface was interspersed with many plants of white primroses and yellow *Calathodes*, a refreshing sight after travelling through such a long waste of *Rhododendron*. A colony of marmots lived in the rocks above the camping ground. I always understood that they avoid the damp climate of the Sikkim mountains and live only in the dry regions beyond the snows. The tailless rat, another denizen of the same dry

climate, was represented by numerous individuals scampering amongst the *Rhododendrons*. A great extent of land beyond the camping ground is swampy and covered with *Rhododendron campanulatum*. The stepping stones across the wettest parts are formed of slabs of a slate-like gneiss which are resonant when struck. Various species of *Sedum* of the section *Rhodiola* and the golden *Chrysosplenium alternifolium* are common in the clefts of stones, partly submerged in the water. The ridge above is steep and its black barren crags of foliated gneiss present a most forbidding appearance.

The following day we marched to Gambothan. Since we left Phalut our marches had been along the crest of the Singalelah, excepting when we rarely descended to and traversed the Nepalese side but here the path after running through the swamp at Megu, ascends steeply and passes to the Sikkim side through a narrow depression guarded on each side by weatherworn cliffs. Grass covers this ascent, and the bright blue flowers of *Primula pusilla*, *P. glabra*, and *Delphinium alpinum* give an unique character to the place by their plentiful presence. In the clefts of a rock we found a small simply pinnate *Polypodium* and a species of *Pellaea*.

The tract into which we emerged wore a different aspect to that we had just left. Above us towered enormous walls and pinnacles of bare rock, intersected by equally stony valleys, all tending towards the broad and terraced slope over which we marched without difficulty. *Rhododendron Anthopogon* and *R. setosum* were the only woody plants. On the sides of the rocks along the terraces *Saxifraga imbricata* and *S. Jacquemontiana* grew in dense moss-like cushions spangled with white and yellow flowers. The soil is covered with a thick turf of grass and sedges, amongst which are innumerable plants of *Primula Stuartii* and a species of *Anemone*. Beyond this first terrace the route led over alternate flats and ravines, and passed four lakes. At first the rocks near the path are scattered singly over the ground; further on the whole surface of the hill is covered by a confused mass of glacier-deposited boulders where the path is marked at intervals by upright white stones. Very little vegetation, except moss, maintains an existence in this wilderness. Sir Joseph Hooker in his admirable account of the Physical Geography of Sikkim, thus explains the cause of this barren desolation:—"Glaciers, again, descend to 15,000 feet in the tortuous gorges which immediately debouch from the snows of Kinchinjunga, but no plants grow on the debris they carry down, nor is there any sward of grass or herbage at their base, the atmosphere immediately around being chilled by enormous accumulations of snow, and the summer sun rarely warming the soil."

Attaining a ridge marked by a rudely built monument bearing a

small flag, we descended a steep gorge down which a stream urged its turbulent course. Its bed was cumbered with gneiss blocks, with many of a fine grained granite, transported from higher levels. This stream effects a junction with two others to form the Rangbi river at a flat expanse called Gambothan. The sheltered situation of this place favours the growth of large pine trees and copses of a willow, *Salix Wallichiana*, fringe the river bank. From eastward another tributary flows through a broad grassy valley, which rapidly attains a high elevation, and for a short distance towards the south the united rivers flow calmly through a forest of *Abies Webbiana*. The most noteworthy plant growing in the desolate locality we had traversed is the gigantic Rhubarb, (*Rheum nobile*), always associated in the traveller's mind with barren precipices where it delights to grow, and where it heightens the weird effect of such scenery by its cadaverous stave-like stems; for only by closer inspection can the actual beauty of the plant be realized. The only perfect specimens existed on inaccessible rocks, as the shepherds collect and devour all they find within reach.

The elevation of Gambothan, by B. P. thermometer, was 12,400 feet.

Leaving Gambothan, a steep ascent was made to the summit of the ridge—13,300 feet in elevation. For half the distance there is a scattered forest of *Abies Webbiana*, *Juniperus recurva*, *Rhododendron campanulatum*, *Prunus rufa* and *Betula utilis*; the upper part being almost wholly occupied by *Rhododendron Anthopogon* and *R. setosum*. These when bruised or trodden upon exhale a strong perfume from the superficial glands with which they are covered, aggravating the headaches to which all are subject at high elevations. *Gentiana stylophora* is exceedingly common. Beyond the ridge is the broad open summit of Bokto, covered with grass on which two large flocks of sheep were feeding. From this a descent has to be made into the valley of the Yangsap through dense growths of *Rhododendron*, *Abies Webbiana*, *Pyrus foliolosa* and *P. microphylla*; beyond is a steep hill almost devoid of vegetation and covered with boulders. The path winds up its right flank to a depression below its summit at about 14,000 feet elevation. There is a fine wood of *Juniperus pseudo-sabina*, and the shrubby vegetation mainly consists of a *Berberis* not yet in leaf. Descending somewhat, we crossed two small plains with a steep low ridge intervening. On these level tracts intersected with sheep walks it would have been almost impossible to keep the proper paths had not the shepherds marked them with upright slabs of stones at regular distances. Leaving the second plain, a steep scramble along the inclined foot of an

enormous black gneiss cliff brought us to the bank of the Ratong river, on whose further side we camped on a flat grassy knoll, the only cleared spot in a waste of Rhododendrons.

Next morning we took the Kanglalama path and continued up the valley towards the north-west. We crossed one or two alternating flats and transverse ridges, and surmounted a high spur coming out on a large plain rendered exceedingly swampy by a network of shallow streams. It seemed of very large extent, but we could not define its boundaries through the fog. There was no inducement to stop or proceed further in this direction; so we retraced our way to within a short distance of our last camping ground, and then ascended a grassy slope to the east. The descent on the other side led steeply through grassy pastures in which grew a species of *Astragalus* and a dark purple species of *Anemone*. The floor of this valley is also a succession of terraces each terminated by a bank over which the river pours in masses of foam. There are signs of a more varied vegetation later in the season but at present there is very little scope for botanising.

*Primula denticulata* and *P. reticulata* resembling *P. sikkimensis* grow on the verges of watercourses. The valley lower down descends precipitately and the flanks of its spurs are clothed with Pine forests. The next day we halted at this place, called Rongjing by the shepherds. As rainy weather had prevailed without intermission since the commencement of this expedition, my men were quite disheartened; and, being afflicted with complaints induced by wet and cold, they begged me to hasten into the warmer valleys of Sikkim.

Being reluctant to subject them to further hardships in this inhospitable region, I acceded to their request and informed them that I should go to Yoksun after spending a few days at Jongri, a locality which I was anxious to see, as it was the goal of one of Sir Joseph Hooker's most heroic expeditions.

Returning to Tegya La we followed the course of the Ratong for about a mile, crossed it by a bridge and travelled eastwards up a very steep hill covered with Rhododendrons; *Cryptogramme crispa* was plentiful along the path. The entrance to the undulating top of Jongri is marked by a shallow lake said to be dry in the winter. We camped on a terrace immediately below two stone huts. Many plants were springing up amongst the grass, but the only ones in bloom were *Potentilla peduncularis*, *P. microphylla*, *P. coriandrifolia*, *P. albifolia*; *Primula reticulata*, *P. Stuartii*, *P. pusilla*, *P. glabra*; *Pedicularis siphonantha*, *Geranium polyanthes*, *Ranunculus affinis*, *Mecconopsis simplicifolia* and *Phlomis* sp. A majestic species of *Mecconopsis* grew near the huts in dense clusters 2 to 3 feet high. The flowers

vary in diameter from 5 to 7 inches, are of an intensely vivid blue on opening and change afterwards to purple. I was informed by the Bhutias that it was not a native of Sikkim, but had been introduced by them from Nepal. The mountain top of Jongri, which is admirably described by Sir J. D. Hooker, is formed of alternating knolls and hollows ranging from 13 to 14,000 feet. Much of its surface is covered with *Rhododendron Anthopogon* to the exclusion of other vegetation. To the east of the camping ground is a wood of *Rhododendrons*, mostly *R. lanatum* and *R. campanulatum*. About 12,500 feet, *Primula pulchra* flourishes on the rocks.

After staying a few days at Jongri I marched down to Yoksun. For about a mile the path runs eastward along Jongri, and then descends steeply for 7,000 feet, enabling one to pass in review the gradation of vegetation from alpine regions to the subtropical zone. A few gigantic Yew trees grow a little above the Ratong. After crossing the Ratong, we travelled along the slopes on its left bank by one of the most difficult and dangerous paths in Sikkim to Yoksun. This place is unique from its peculiar formation amidst such precipitous surroundings. The copsewood which once enhanced the beauty of the flat is now reduced to a gaunt gathering of pollarded and charred trunks, but the beautiful little lake is still surrounded by forest trees. Here, and everywhere in Sikkim at the same elevation, there are large areas covered with *Edgeworthia Gardneri*.

I halted for two days to allow my men to recuperate in such a congenial climate. *Polypodium rostratum*, so rare in the Darjeeling district, is the commonest fern here. As Mr. Gamble once told me that Mr. Levinge had found it growing on the same *rhizome* with *Drymoglossum carnosum*, I searched carefully for a confirmation of the fact, but I failed to find any instance of it: indeed I did not perceive one plant of the latter species.

Variety of ferns is a notable feature of Yoksun. The commonest are *Polypodium rostratum*, *P. membranaceum*, *P. lineare*, *P. Boothii*, *P. fissum*, *P. amænum*, *P. lachnopus*, *P. argutum*, *Nephrodium hirtipes*, various varieties of *N. Filix-Mas*, two forms of *Aspidium aculeatum* one of *A. auriculatum*, *Oleandra neriiformis*, *Pteris aquilina*, *P. Wallichiana*. Of orchids I observed *Malaxis sikkimensis*, *Microstylis biloba*, *Cælogyne ochracea*, *C. cristata*, *Otochilus* sp., *Eria alba*, *Cymbidium Hookerianum*, *Dendrobium chrysanthum*, *Saccolabium calceolare* and a species of *Calanthe* in leaf. *Remusatia vivipara*, *Amorphophallus* sp., *Arisæma speciosum*, *Hedychium coronarium* and *Piper nepalensis* were common on the rocks. The principal trees are *Erythrina arborescens*, *Castanopsis tribuloides*, *Pieris ovalifolia*, and two species of *Aralia*. The shrubby

vegetation is composed of *Mæsa rugosa*, *Edgeworthia Gardneri*, *Dichroa febrifuga*, *Camellia drupifera*, and a few other species. The villagers grow clumps of a *Bambusa*, and a few plants of *Arundinaria Hookeriana* have recently been planted near the lake. This beautiful bamboo abounds in Sikkim from 5 to 7,000 feet, and is the kind exclusively used for roofing temples and houses. For this purpose the culms are cut into short lengths, flattened out and laid on as shingles. These are said to be very durable and to make perfectly watertight roofs.

The cultivated crops are buckwheat, millet and a little maize. After the grain is sown no care is taken to keep fields in proper cultivation. One enclosed plot was full of ganja plants (*Cannabis indica*) in splendid condition.

From Yoksun I marched to Tumlong through tropical and sub-tropical vegetation similar in all respects to that of the Darjeeling district.

By comparison with the drier regions of Upper Sikkim which I afterwards visited, I considered that the main characteristic of the vegetation along the Singalelah Range is its poverty in variety of forms and its superabundant wealth in individual species of Rhododendrons. I only collected about 200 species of plants in flower and fruit. There was, however, evidence to prove that the floral harvest would have been more remunerative later in the season. Sir J. D. Hooker, in his appendix on the Physical Geography of Sikkim, states "the banks (of rivers) between 8,000 and 14,000 feet are generally covered with Rhododendrons, sometimes to the total exclusion of other wooded vegetation, especially near a snowy mountain, a cool temperature and great humidity being the most favourable conditions for the luxuriant growth of this genus." Such conditions prevailing throughout the Singalelah Range, due to its proximity to Kinchinjunga account for the overwhelming abundance of Rhododendrons, and may also be accepted as probable reasons for the comparative absence of herbaceous plants (in ordinal and generic forms), which are unable to maintain a struggle for existence in such an adverse climate and against such formidable competitors.

*2nd Tour. The Lachung Valley.*—I arrived at Tumloong on the 7th July, and was detained there until the 24th waiting for supplies which were delayed by the break of communications caused by the excessive rains.

Immediately on their receipt I commenced my second excursion and marched through the hot tropical valley of the Teesta, arriving at Choongtam, at the junction of the Lachen and Lachung rivers; on the 28th. Near Choongtam a remarkable transition from tropical

to temperate vegetation takes place with no palpable increase of elevation. *Cnicus involucratus*, *Astragalus pycnorhizus*, *Eupatorium cannabinum*, *Anemone vitifolia*, and a few other plants served to accentuate the change. *Leptocodon gracilis*, a fragile climber with blue flowers rambled over bushes everywhere. I collected many specimens of *Pleopeltis rhynchophylla* from a tree at the end of the Lachung cane bridge.

The hill above Choongtam ascends abruptly to 10,000 feet, and is almost entirely clad with grass alone. It forms the termination of a lofty range running southwards from Kinchinjhow, and divides the Lachen and Lachung valleys. The Tibetans aver that this long spur possesses but one practicable pass, namely the Sebo La between Momay Samdong and Tungu; but by dint of persistent enquiry I discovered that there are at least two more—one from Lachung to somewhere near Latong, the other from Yeumtong to Tallum Samdong. I was informed that they are rarely used, a fact explained by the lack of the necessity of frequent intercourse between the inhabitants of the two valleys.

From Choongtam we marched to the village of Lachung in one day. As far as Keadom the valley is narrow, and the path runs along the river bank for most of the way. Here the valley expands into a large flat, with an elevation of 6,600 feet, which enjoys such a warm and sunny climate that maize, millets and other tropical crops are successfully cultivated. Onwards the valley again becomes narrow, but two or three miles below Lachung it broadens considerably and remains open for some miles above the village.

A large proportion of subtropical trees and plants ascend to a short distance above Keadom. These are succeeded by a dense shrubby vegetation of *Hydrangea*, *Rosa macrophylla*, and *R. sericea*, *Prinsepia utilis*, *Pyrus*, *Pieris ovalifolia* and *P. formosa*, *Zanthoxylum*, *Rhododendron arboreum*, *R. ciliatum* and Maples, etc. Other plants are *Leycesteria formosa*, *Buadlea macrostachya* and *B. Colvillei*, *Berberis*, and *Rubus niveus* with palatable fruits. *Roscea alpina*, the Box-like *Sarcococca pruniformis* are in great quantity. The handsome fern *Osmunda Claytoniana* overruns large areas in the manner of Bracken at lower elevations. Two species of *Leucostegia*, *L. Hookeri* and *L. membranulosa*, with sweetly hayscented foliage, and a large stipitate form of *Pleopeltis simplex* grow in a wood at about 8,000 feet. *Goniophlebium ebenipes* was in dense clusters on the tops of many of the numerous rocks.

This locality is eminently distinguished by its variety of Coniferous trees. *Abies Webbiana*, the dominant species on the humid mountains of the Singalelah and Chola Ranges, even here maintains

its supremacy in numbers. It ranges from 9 to 13,000 feet. Up to 11,000 feet it grows intermingled with the other lighter foliaged pines, but from that elevation to its highest limit, it exists alone or associated with the equally dark coloured *Juniperus pseudo-sabina*, so that nothing breaks the monotony of their sombre aspect on the slopes which they clothe with their lofty forests. *Juniperus pseudo-sabina* and *J. recurva* are the two last representatives of arboreal vegetation, both attaining 15,000 feet, the former as a small, stunted, weather-worn tree, the latter, as a prostrate intricately branched shrub. Large quantities of planks cut exclusively from *Abies Webbiana* are annually exported to Tibet. Their preparation is an important industry of the inhabitants of Lachung, who shape the timber with no other appliances than the axe and wedge.

*Picea Morinda* and *Tsuga Brunoniana* are found between 8 and 11,000 feet. The former is a tall conical tree with thick trunk and dark green pendulous branches, the latter has spreading branches drooping at the extremities and bears very small cones. *Larix Griffithii*, the only Himalayan Larch, is restricted in its distribution to Eastern Nepal, Sikkim and Bhutan; and, previous to its re-discovery by Sir J. D. Hooker, its existence was only known from a notice in Griffith's journals. It is pyramidal in outline and attains a height of sixty feet. The branches are long and pendulous and support erect cylindrical cones closely resembling those of *Picea Morinda*. It first appears at 8,000 feet, becomes plentiful at 9,500 feet, and ascends to 12,000 feet. It is the only deciduous conifer in Sikkim, the leaves falling in autumn to be renewed in the beginning of the following summer.

The peach and apricot, introduced from Tibet, are cultivated by the villagers at Lachung, but in no great quantity. I was informed that the fruits of both ripen in the end of September. *Pyrus sikkimensis*, a wild Crab-apple tree, is common, but its austere fruit is only pleasantly edible when stewed with sugar. A little barley is reared with radishes and turnips, and these were the only vegetables I could obtain worth eating; the scanty yield of potatoes consisted of wretchedly small tubers, so waxy as to be nauseating when cooked.

The Tankra Mountain was within easy distance of Lachung, and as it promised a quick introduction to the Alpine Flora which I was so anxious to see, I determined to visit it at once. We crossed the Lachung river, threaded our way through the narrow dirty lanes of the village, and immediately climbed up the grassy slope above it. For about a mile the path runs through a dense herbaceous vegetation composed of the plants I formerly enumerated at Lachung. A beautiful small pink lily—*Lilium roseum*—grew profusely on banks

associated with *Rosœa alpina* and *Drosera peltata*. At 9,500 feet we passed through a fine grove of small trees of Rhododendrons, Maples, Roses, *Lindera Neesiana*, *Betula utilis*, and the laurel-like *Daphniphyllum himalayense*. In a mossy hollow within this wood, I found a large quantity of the delicate little fern, *Polypodium trichomanoides*. *Goniophlebium subamanum* depends from the trunks of silver Fir; and *Goniophlebium erythrocarpum*, another epiphytic fern, accompanies arboreal vegetation to the end. Passing the grove we entered the magnificent forest of pines which extends without a break to 12,500 feet. We marched to its upper skirts, where we camped after clearing a sufficiently large plot of ground near a stream winding through an expanse of Rhododendrons. Two species of *Cremanthodium*, *Polygonum vacciniifolium*, *Oxyria digyna*, *Pedicularis* of various species, *Potentilla fruticosa*, beautiful yellow and white Saxifrages, *Epilobiums*, *Lactuca macrantha* *Parnassia* and Aconites were the commonest plants observed.

The following day we held on our course upwards. The region of trees was soon left in the rear, and a low growth of *Rhododendron campanulatum* succeeded, showing the dark glaucous tints of its unfolding leaves. The bladder headed *Saussurea* (*S. obvallata*) thrives on the damp margins of watercourses, and bumble bees were busy amongst its foetid flower heads. These are in clusters of a dark brown colour, enclosed in inflated white papery bracts forming an ovate head, and yielding sufficiently to allow insects to insinuate themselves with ease. The woolly headed *Saussurea* (*S. gossypiphora*) delighting to grow in sandy debris appeared at first sight to be only a ball of white fleecy wool. The flower heads when young are completely enveloped; but on the approach of maturity a ring opens on the top disclosing the inflorescence inside. Another remarkable plant, in similar situations, is *Crepis glomerata*, whose carrot-like stem buried in the ground is flattened on a level with its surface, and bears a broad head of yellow flowers, surrounded by small radiating leaves pressed closely to the soil. *Rheum noule* is visible on the faces of all the cliffs around, and ascends to 17,000 feet.

Our third day's camp was pitched below the ascent to Kanko La, which passes at the gorge, cut by the river through a low line of cliffs, forming a barrier across the head of the Tankra Choo Valley.

The next day we crossed this by the frequented path, and followed the track to the Tankra pass, which is at an elevation of 16,000 feet. The terminal valley slopes gently to the pass, is exceedingly rocky, and is bounded by snowy ridges; and much snow lay in its hollows. The rounded surface of the pass is a conglomeration of sand and

boulders which are constantly sliding down from the crags on either side.

On the Tibetan side, a narrow grassed valley descends steeply. Fog effectually prevented a more extended view. Between the Kanko La and the barren glacier below Tankra La there was a multitude of bright-hued flowering plants. Brown and yellow *Chrysosplenium*, yellow Saxifrages, blue and yellow forms of *Corydalis*, a few species of *Pedicularis*, beautiful small primroses—*P. uniflora*, *P. muscoides*, *P. soldanelloides*,—*Ligularia*, *Rheum nobile*, some blue Gentians and the bladder headed *Saussurea* were the most notable. The plants I found on the pass are those enumerated by Sir J. D. Hooker. In addition to his list, I may state that *Meconopsis horridula*, a lovely plant affecting only the most inclement situations, was collected in full bloom from under the shelter of rocks. I stayed for two hours at the pass in the vain hope of the fog lifting to give me a better view. During this time the continuous winds were most variable, and the variability was rendered more obvious by the way in which vapour was deposited by different currents. The wind which blew from the Tankra Valley on the south-west brought hail and snow, that from the south-east in Tibet precipitated rain. The same meteorological conditions prevailed during Sir J. D. Hooker's visit. The Tankra La lies south of the summit of Tankra mountain, to the east is a long rocky ridge cleft by the minor pass of Kanko La; and between this and the culminating peaks is a large, shallow basin with undulating surface through which flow the headwaters of the Tankra river. Those on the north spring from many points under snow fields, that on the south-east rises below the pass and is immediately lost in the great central moraine, re-appearing at its lower end as a large and swiftly flowing torrent. It is joined near the Kanko La by the united streams from Tankra; after effecting the junction, the river turns sharply to the west through the deep and narrow defile of the pass and hastens precipitately downwards for some miles until it debouches in the Lachung river a little south of the village of that name. From the Kanko spur to the limit of Pines at 13,000 feet, the valley is broad and shallow; here it suddenly narrows and remains so to its termination. During the week I spent on this excursion, the weather was uniformly boisterous and wet, while those of my party who remained below at Lachung asserted that they had enjoyed calm sunny days and clear nights.

The fragrant spikenard (*Nardostachys jatamansi*) is plentiful on Tankra, and the Scrophularineous plant *Picrorhiza kurroa* intensely bitter when chewed, is abundant about 14,000 feet, and is held in much repute as a febrifuge and tonic. The only woody plant above 15,000 feet is the humble *Diplarche pauciflora*.

I returned to Lachung, where I halted for a week to dry the numerous specimens collected during the excursion to Tanka La, and also to make preparations for a journey to the Donkia Pass at the head of the Lachung Valley, and the most northern point I could reach in Sikkim.

We started on the 13th August, and arrived at Yeumtong the same day. The path runs close to the west bank of the Lachung river the whole distance. About half way we crossed an enormous landslip which had partly buried a large forest of *Abies Webbiana* and Larch.

The interesting feature of this day's journey was the extensive Pine woods through which we travelled. On the western slopes they grew down to the verge of the stream, and every tree was festooned with long gray streamers of the Lichen *Usnea barbata*. I was told that, when reduced to great straits, the Tibetans made use of this unpromising plant as food; when boiled it was said to be gelatinous and palatable, and as nourishing and life-sustaining as beef.

We saw many tailless rats, but I was prevented from procuring specimens by my desire to respect the superstitious notions of the Tibetans and Lepchas regarding them. I was told, with every appearance of belief on the part of my informants, that the killing of one of these animals was certain to be followed by storms of snow or rain according to the season of the year, and many instances of personal experience were related to me in corroboration of the fact. The Tibetans are reminded of the near approach of winter when they observe these rats busy themselves in preparing their winter quarters.

The valley is wide as far as Yakcha; it there narrows for a considerable distance, broadening into large swampy flats intersected with streams towards Yeumtong. The spurs on the western flank are precipitous rocky and sterile, supporting vegetation only at their sheltered bases, but forests clothe the opposite side with the verdure. Every mountain mass in this region facing a southerly direction in the least degree is, in summer, exposed to the full force of the damp southerly winds laden with mist which blow with increasing violence as the day advances, to die away only at night. These continuous currents rapidly disintegrate the surface, washing down the superincumbent earth and wearing away rocks which become precipices or crags of fantastic shapes. Vegetation, therefore, cannot find permanent foot-hold under such circumstances, and its abundance is confined to the sheltered flanks where a copious rainfall is absorbed by the deep and fertile soil.

The increase of 3,000 feet in elevation between Lachung village and Yeumtong causes the appearance of many new plants along the

route. Composites become more numerous and gregarious. *Inula Hookeri* beautifies dry knolls with its densely leafy stems and large heads of yellow flowers. *Erigeron multiradiatus*, some species of *Senecio*, *Anaphalis* and *Aster* are equally plentiful. Various *Thalictrums* and *Halenia elliptica*, all with blue and white flowers, grow in the grass and low thickets. Orchids are well represented by many *Habenarias*, *Satyrium*, and the small purple *Orchis Chusua* (allied to the common *O. latifolia* of England). The Monkshood was flowering and attained a height of 6 feet in flat grassy fields. Cattle and horses are allowed to graze at large in places infested with this plant, but sheep and goats do not possess the same instinctive knowledge of its poisonous properties, and great care has to be exercised by the shepherds when driving them through these localities.

*Myricaria germanica*, *Allium*, *Meconopsis simplicifolia*, whose spikes 3 feet in height greatly excel the stunted specimens seen on Singalelah, the large wild Rose (*Rosa macrophylla*), with bright red fruits, and shrubby Berberries, were all common.

The following day was Sunday, so I halted at Yeumtong. The tents were pitched between the huts and the river which flows tranquilly in a broad shallow bed down the whole length of the flat. Opposite is the snowy mountain with a glacier reaching a lower level than any other in Sikkim as Sir J. D. Hooker mentions; a thick turf of grass covered the surface of the flat. A yellow anemone (*A. obtusiloba*), with leaves appressed to the ground, a surculose Saxifrage, the Dandelion, *Taraxacum officinale*, the aromatic yellow *Elsholtzia eriostachya* and groups of brilliantly yellow flowered *Senecio diversifolius* gave colour to the scene. A small swamp north of the camping ground was brightened by the yellow flowers of *Pedicularis tubiflora*, and a small floating *Ranunculus*, and beyond, in a small wood of silver fir, I found many specimens of *Meconopsis simplicifolia* and *M. nepalensis* in fruit. I collected a large supply of seed from the former, but nearly every capsule of the latter had been destroyed by a small white caterpillar. Neither species ever grows in the open, both preferring the shelter afforded by rocks or small bushes on the skirts of the thickets. The commonest plant was *Cnicus eriophoroides* with strongly spinose leaves which penetrate the thickest cloth, and cause a smarting sensation in the skin. Other plants were *Salvia glutinosa*, *Lychnis nutans*, *Cucubalus baccifer* and *Asarum himalaicum*.

Aroids of the genus *Arisæma* are common. In early summer their tuberous roots are prepared and used for food according to the method described by Sir J. D. Hooker. I was presented with a few glutinous cakes made in the most approved style, but the taste was

so peculiarly disagreeable that I could not persuade myself to eat more than one mouthful.

Yeumtong is a large cattle grazing station and depôt for Tibetan exports and imports. Communication thus far from the lower valleys is kept open by the people of Lachung who carry loads of planks, bamboo, rice, dye-stuffs, such as the leaves of *Symplocos* and the roots of *Rubia cordifolia*, which are transported by yaks to Tibet. In exchange the Tibetans bring down loads of salt, barley, blankets and other commodities for the inhabitants of Lower Sikkim. I could not ascertain how many yak loads of merchandise are carried annually over the Donkia Pass, but every day during my stay in this part I saw herds of at least 10 or 12 yaks, and often many more either going or returning. Looking northwards from Yeumtong, the slope of the valley to an elevation of 13,000 feet is easy and is black with pine forests. Above, the land is red and sterile. On the west a tributary stream flows from behind Changokhang along the base of a long declivity of sand. The view higher up is cut off by jutting spurs below Momay Samdong.

The following morning we marched to Momay Samdong, elevation 15,300 feet. The first and the last two miles of the path are easy, but the intervening portion is steep. A forest of Silver Fir, Maple, Birch, Pyrus, Rhododendron and other trees extends to 13,000 feet; for a few hundred feet further some scattered black Juniper trees occur; an equal distance is occupied by Rhododendrons and Willows, and passing the spurs which terminated the view from Yeumtong, the valley is broad with enormous rocks on its surface, and the surrounding hills are rocky. I have nothing to add to the excellent description of this spot by Sir J. D. Hooker, but a place with more inhospitable surroundings can scarcely be imagined. A few yaks were grazing, the sole survivors of large herds almost annihilated by an epidemic of rinderpest, which raged during the previous year.

This great calamity had impoverished the inhabitants of the valley, as for the greater part of the year they depend for sustenance on the curds and cheese made from the milk yielded by their flocks.

As the morning of the 10th August was bright and sunny, holding out hopes of a fine day, a promise unfortunately not fulfilled, I set out for the Donkia Pass, seven miles from Momay, and the most northerly point I could reach in Sikkim. The tracks lead through a waste of stupendous rocks, and the stream becomes divided into many channels. The hills rising around it are masses of rock and rubble, forming a most forbidding landscape in the aggregate. The shallow waters support an abundance of reddish *Sedum* and *Rheum*

*nobile*. Myriads of blue Gentians unfolded in the brief glimpse of sunshine we enjoyed, and *Allardia glabra* grew in low dense tufts, bearing large sessile flowers with yellow disks and purple rays. The musk-scented *Delphinium glaciale* ascends to 17,500 feet accompanied by *Aconitum Napellus* reduced in size to a small plant with two or three leaves bearing but one short pedicelled flower. Other plants were *Ranunculus lætus*, *Cyananthus* of two species, the Edelweiss (*Leontopodium alpinum*), *Erigeron*, *Cremanthodium reniforme*, *Lactuca Dubyæa*, *Crepis glomerata*, *Saussurea*, and the curious lichen-like *Antennaria muscoides*. *Rhododendron nivale* and *Ephedra vulgaris* were the only woody plants. The feature of the vegetation from 17,000 feet upwards is the prevalence of plants growing in dense hard hemispheric tufts such as *Arenaria*, *Saxifraga*, *Saussurea*, *Astragalus*, and *Myosotis Hookeri*. The last steep ascent to the pass 18,100 feet elevation, is devoid of vegetation. The view across Cholamoo to the Kambajong mountains was clear and we were able to appreciate fully the graphic account of this wonderful region which Sir J. D. Hooker gives in such perfect detail.

My orders forbade the crossing of the Donkia, so I returned to Momay in the evening through a blinding storm of snow and rain.

As I was anxious to penetrate to the Lachen Valley through the Sebo La, I waited at Momay for a week in order to obtain good weather for the attempt, but the cold south wind drove a thick mist and drizzling rain without intermission, and I was compelled to relinquish the idea. One day I went eastwards to the great glacier of Kinchinjhow. Passing the hot springs noted by Sir J. D. Hooker, and climbing to the crest of the terminal moraine, we walked along the top of a lateral one leading far into the snowy billowy mass of the glacier. I was surprised to find many plants flourishing in such a bleak place. *Eriophyton himalaicum* was common. It is a white woolly *Labiata* with bright blue flowers peeping from under the leaves; I have never observed it but on dry sandy slopes. The other plants were a minute *Saxifraga* with extensive runners, a small *Gentian*, *Pedicularis* of three species, *Festuca* and *Carex*. *Rhododendron nivale* was dead and withered, having probably been killed by the severity of the previous winter, but, strange to say, *Potentilla fruticosa*, in its largest and most developed form, and not the creeping variety we should expect to find here, was covered with flowers and foliage and was as much at home amongst ice and snow as it is at the more temperate elevation of 10,000 feet. From Momay Samdong I returned to Yeumtong and halted there a few days. I ascended to the glacier on the opposite side, which Sir J. D. Hooker failed to reach through the gorge. Now-a-days there is a cattle track leading to the high pastures, so that progress is easy.

*Rosa sericea* is the commonest shrub in the pine forest and *Salix Wallichiana* and *Pyrus microphylla* are abundant. Between the summit of the first ridge and the glacier, the path runs along the side of the stream, the rest of the area is too encumbered with boulders to be walked on with safety. Above 13,000 feet the forest of silver fir is replaced by impenetrable Rhododendrons, and a few stunted trees of black Juniper. There is little variety in the herbaceous vegetation, the biting air radiating from the glacier being too chilly to suit even cold-loving plants. *Podophyllum Emodi* yielding red fruits, eaten by the Tibetans, *Swertia Hookeri*, *Rheum acuminatum* and *Cnicus eriophoroides* were conspicuous by their abundance and size.

The weather at Yeumtong was also uniformly wet and miserable, so I started for Lachung on the 20th August. Arriving the same day I stayed to dry my collections and to make arrangements for an excursion through the Sebu Valley to Ghora La, a part as yet unvisited by any naturalist to my knowledge.

In his "Himalyan Journals" Sir J. D. Hooker notes "about five miles above Lachung the valley forks, the eastern valley leads to lofty snowed regions, and is said to be impracticable." A lofty precipice at the immediate entrance to this valley, and on its northern flank, attracted my attention. On enquiry, I discovered that one of my men had ascended to Ghora La, the first pass from the northern end of the longitudinal range which extends from Donkia to Gipmoochî, and forms the eastern boundary of Sikkim. From a distance the forbidding aspect of this valley would naturally lead one to conclude that to explore it would be a matter of great difficulty and danger. It is almost useless to interrogate the Tibetans as to the feasibility or otherwise of ascending any comparatively unfrequented valley, as their jealous exclusiveness prompts them to overrate natural difficulties in the hope of deterring Europeans and other strangers from exploring the various practicable routes to Tibet. The path to Ghora La runs up the valley of the Sebu river, a large and turbulent stream. I was informed that this valley is held in considerable veneration by the Tibetans on account of the lofty and unique precipice guarding its entrance, for the sacred mountain of Donkia at its head, and also for the sacred inscriptions which were carved on the face of a cliff half way up the ascent to Ghora La; but this last feature is now completely obliterated, as the whole face of the rock has fallen down. At the summit of the pass, and visible from a considerable distance, is an irregular pillar-like rock, which I was told is the figure of a god, but its real character was apparent on closer inspection.

Leaving Lachung on the morning of the 3rd September, I took the following route. The Lachung valley path was taken for three miles to the village of Yakcha. Here the track to Gho: a La breaks off abruptly to the north-west, a direction which is pursued more or less the whole way. A short walk through a forest, containing beautiful Conifers, *Picea Morinda*, *Tsuga Brunoniana*, *Larix Griffithii*, brought us to the Lachung, which is crossed by a good wooden bridge. On the other side it is steep for a short distance, and afterwards the path runs almost level over somewhat swampy ground. The river Sebu, which, from its source downwards, is a swiftly flowing torrent coursing through a boulder-strewn channel, here becomes broader, shallower and more tranquil. Small willow-trees fringe its banks, with *Euonymus* and *Ilex intricata*, while *Thalictrum* is specially abundant. Beyond this, a sudden ascent is made along the base of a stony precipice with *Woodsia lanosa* growing in its clefts; and a little further on I found its allied species *Woodsia elongata*, the only occasion I recollect of their association, as the former affects a more alpine elevation as a rule. The remainder of the day's march was steep through a large forest of silver fir, until we arrived at the first convenient camping ground, a cattle station named Sebu, artificially formed by a clearance in the forest. Here *Ainsliaea pteropoda*, *Heraeleum*, and *Galeopsis Tetrahit* monopolized spots untrodden by cattle.

The northern side of the valley is enclosed by a continuous precipitous spur, broken in one place only by a deep forest-clad depression. At the foot of the chief one at the commencement of the valley, is a small temple where services are held on certain days of the year. The range on the other side being more gently sloped, is covered with forest and succeeding smaller vegetation, and is more diversified by ravines.

Of trees which do not extend above 10,500 feet in this valley, are *Picea Morinda*, *Tsuga Brunoniana*, *Larix Griffithii*, *Prunus Padus*, *Pyrus lanatus*, *Pyrus sikkimensis*, *Hydrangea*, *Ilex diphyrena*. Above this elevation to 13,000 feet is a continuous forest of *Abies Webbiana* associated with Maples, Birch, *Viburnum*, *Berberis*, and *Rhododendron*; *Aconitum Napellus* grows luxuriantly on the grazing ground at Sebu.

At 11,000 feet large trees of *Juniperus recurvus* appear, and at 13,000 feet (the upper limit of *Abies Webbiana*), and for a short distance above it they form the only arboreal vegetation.

From 13 to 15,000 feet there is an impenetrable growth of *Rhododendrons* and *Willows*, with numerous small trees of *Pyrus foliolosa*, and *P. microphylla*; and, intermingled with grass under-

neath these bushes, is an equal luxuriance of herbs, such as *Aconites*, *Senecios*, *Saxifrages*, *Primulas*, *Potentillas*, *Polygonums* and *Thistles*. *Cnicus eriophoroideus*, which is moderately common in most valleys, is so abundant here as to be a perfect pest.

From Sebu (12,500 feet) the next march was to a yak grazing-station named Sethang, at an elevation of about 15,000 feet. Up to 14,000 feet the floor of the valley is very steep, but about 1,000 feet below the level of Sethang we emerged on a swampy flat, through which the Sebu flows in several channels. Its surface is covered with grass, and its borders are cumbered with *Rhododendron Anthopogon*. A tributary from the west pours over the hollow of a precipice in a magnificent waterfall. Above the plain is a steep rocky barrier thrown transversely across the valley. On reaching its summit we arrived at the camping ground. The coolies took up their quarters in the deserted huts, and my tent was pitched near an accumulation of enormous boulders. A small muddy pond lies at the upper end of the flat.

Here the two branches of the river Sebu unite—one rising in Donkia, the other in the nameless snowy mass south of Ghora La. The former is seen flowing in a deep and narrow gorge; the latter rushes down a steep rocky transverse slope similar to that which we ascended below Sethang. These slopes run parallel to each other, and are probably the terminal moraines of the glacier, which is now confined to the head of the valley. *Rhododendron companulatum* is the common shrub. *Primula Stuarti*, *Meconopsis nepalensis*, *Geranium collinum*, all in fruit, abound on the flat.

On the following morning I walked to Ghora La, elevation 17,000 feet. The path descended into the stream from the Donkia, the ascent beyond winding amongst gigantic boulders on the western side of the slope. At the top is another small plain, and the remaining portion of the valley becomes broader and ascends by a long easy gradient to 16,500 feet.

The valley from this point onwards to near its head is bounded by even ridges and unbroken slopes which are possibly the lateral moraines of the ancient glacier terminating below Sethang.

Both seemed to be elevated 500 feet above the river. A broad terrace runs along the base of the eastern one for some distance. Higher up, the valley expands and the stream again divides. The eye following the course of the western branch, is carried to the snowy mountain of Forked Donkia from whose feet a glacier spreads out over a large area.

There is an accumulation of rocks and sand at the eastern termination of the glacier, and its waters feed a lake white with suspended

silt. This mountain is an object of worship and veneration, and votive offerings of prayer printed cloths fluttered on the banks of the lake. Between Forked Donkia and the pass is a shivered line of crags devoid of snow; the pass itself is an extremely narrow gap with sheer rocks rising sharply on either side. Its final ascent is occupied by a glacier which widens out eastwards into an enormous field of ice under another snowy mountain. The actual ascent of the pass is commenced at a small pool at the end of the glacier. There is no permanent path amongst the shifting mass of rocks, so we had to make our way as best we could up the lateral moraine of loosely poised boulders. Half way up we took advantage of a small snow-field. The last hundred yards was over the glassy surface of the ice in which we cut steps as we advanced.

The available standing room on the pass would scarcely suffice for ten men, and the descent on the Tibetan side is startling in its steepness. Its surface was covered with a shoot of stones. This pass is not practicable for the passage of yaks, and is seldom used by foot travellers. On the north a high naked hill projected eastwards, appearing as a huge pile of stony debris; on the south a large glacier descended. Below lay the broad open grassy valley of the Ridu Chu; beyond were a few isolated rounded peaks surrounding elevated plateaux of large extent, and further back still were mountains of the same dull red colour running east and west, while over them hung heavy masses of clouds which obscured more distant views. The lower part of a snowy mountain, said to be Chumulhari, was seen in the far east.

The district we overlooked is called Kamboo. Medicinal hot springs of great repute occur in it. Phari is to the south-east of Ghora La, but is hidden behind intervening ranges.

The vegetation above 15,000 feet in the Sebu valley is very scanty. *Sedum* of two or three species, *Saxifraga*, *Allardia*, *Meconopsis horridula*, *Cyananthus*, *Gentiana*, *Saussurea* of three species, *Ephedra*, *Rhododendron nivale*, and a few other plants, principally grasses and sedges form the bulk of the vegetation. *Rheum nobile* grows on the surrounding otherwise sterile heights, reaching to an elevation of 17,000 feet.

We found a woolly *Saussurea* (*S. tridactyla*) at the foot of the ascent to the pass, but from thence upwards not even a lichen was visible. This *Saussurea* and *Antennaria muscoides* are supposed by the Tibetans to be the most esteemed of their gods as incense. The plants used in temples are *Rhododendron Anthopogon* and *R. setosum* and a Juniper. I could not obtain definite information as to the derivation of the name "Ghora." I was first told that the sacred

pictures carved near it suggested its name, and I concluded that the name was a contracted form of Gorucknath; afterwards it was explained that the meaning was "winding" in allusion to the winding route to the pass.

Yaks are grazed from 14 up to 17,000 feet in this valley during the summer, and at Sebu I found a large herd of cattle.

From Sethang I returned to Lachung in two marches, arriving on the 8th September.

The time until the 14th was devoted to arranging and packing my collections and luggage. We returned to Tumloong by the Teesta valley path and arrived there on the 20th September.

*Third tour: The Chola range.*—I left Tumloong on the 22nd September for my third and last excursion. The first march was to Rungpo, elevation 6,000 feet, a halting stage of the Sikkim Rajas during their journeys to and from the Chumbi valley, their favourite summer resort. The path descends through cultivated fields to the beds of two arms of the Ryott river which unite a little further down. They are crossed by cane suspension bridges. The succeeding ascent is steep and passes through many fields of dry ground rice and millet. An edible variety of Job's tears (*Coix lachryma*) is grown near watercourses. The whole valley is thickly populated, and the inhabitants practise a careful system of cultivation.

An oak (*Quercus semecarpifolia*) is common at Rungpo, but the rest of the vegetation is of the usual type at this elevation.

Onwards to Chola Pass the marches were made eastwards up a continuously steep ridge. The second day's journey brought us to Laghep (10,400 feet), a small cattle station with a camping ground on a projecting knoll covered thickly with *Iris nepalensis*. This locality is celebrated for its variety of Rhododendrons, every species existing in Sikkim, excepting *R. nivale*, being found within a distance of two days' short marches. It was too early in the season to obtain seeds, as they do not ripen until November.

The plants of *Decaisnea insignis* which Sir J. D. Hooker observed at at 7,000 feet still grow abundantly there.

The next day's march was a short one to Pheyunggong, 12,400 feet, a large flat-topped peak where the *Abies Webbiana* is first seen. Beyond Pheyunggong we descended to the Rutto river, where we found quantities of *Cathcartia villosa* in fruit. This plant is extremely local in its distribution, being found only in this small valley and in one small area near the summit of Lingtu. The ascent continues along the broad valley of Rutto, which becomes bleak upwards. *Abies Webbiana*, however, attains an elevation of 12,600 feet at Chamanako, where we halted.

The first part of the ascent to Chola Pass is very steep, an easy path then leads to the next ridge beyond which is a small and pretty lake. A second slight ascent brought us to another small lake, and a pond lies immediately beneath the pass. The summit of the pass is rounded, and its surroundings are barren rocks. On the Tibetan side a narrow gorge-like valley descends sharply. Snow had fallen the previous night, descending to 13,000 feet. We left Chamanako on the 28th, and resumed our journey along the Chola Range. The path follows the course of the Rutto for half a mile, then crosses it, and an ascent to 14,000 feet follows, through a scrub of Rhododendrons. At 14,000 feet there is a large hollow covered with Rhododendrons, containing two lakes, the larger ovoid in shape, the smaller long and narrow. Attaining the ridge beyond, we descended to the river Rungpo, passing through on the way a narrow defile walled with rock. Another ascent through small Rhododendrons again followed, after which we descended and struck a path from Guntok. We walked along this for a mile, and reached the camping ground named Buthan, a large expanse of green turf closed in on the east by a barrier-like cliff.

During this march we found specimens of *Chrysanthemum Atkinsoni*, the only example of the genus occurring in Sikkim, some small Saussureas with fern-like leaves, Primroses, Parnassia, the Bladder-headed Saussurea, *Senecio amplexicaulis*, and the small Rhubarb, *Rheum acuminatum*.

The following day we marched to Kapup, a small plateau under Zeylap La. We ascended to the top of the rocky barrier east of the camp. From here we obtained a magnificent view of a long trough-like valley terminated by a ridge beyond Kapup. The whole scene was of a warm brown colour from the herbaceous vegetation killed by the late autumn frosts. This valley, which runs southwards, is bounded on the north by the main Chola ridge which forms the political boundary between Sikkim and Tibet. There was a long gradual descent down this remarkable valley, in which are two marshy lakes of considerable extent. Beyond the second lake a deep narrow gorge intervenes. This is clothed with Pine forest, and at the end of the valley the meeting of two opposite spurs hold back the stream so as to form a large lake reflecting the pine woods on its dark tinted surface. Surmounting the ascent from the stream, we emerged on the grassy flat of Kapup with a few scattered silver fir trees, small Rhododendrons and shrubby *Berberis* in its sheltered parts. The Spikenard, *Nardostachys Jatamansi* was common, but few plants grew in the closely cropped herbage.

On the 30th September I walked to the pass, and returned through Kapup to Gnatong. No vegetation exists at the pass itself,

and that below it was fast withering. At Gnatong the plants still in flower were *Onosma*, *Senecio*, and a few species of *Saussurea*, *Suertia* and *Saxifraga*. From Gnatong I travelled by the military road to the Teesta Bridge, arriving at Mongpoo on the 5th October.

During the whole of this excursion I had only one fine day, namely, the 28th September. A dense fog with drizzling rain prevailed to my disappointment during the rest of the time which prevented me from noting the details of the scenery I passed through.

RECORDS  
OF THE  
BOTANICAL SURVEY OF INDIA

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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VOLUME I

No. 3.

REPORT ON A BOTANICAL TOUR IN KASHMIR,

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WITH A MAP.



CALCUTTA:  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1894.



# REPORT

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### A BOTANICAL TOUR IN KASHMIR.

1893.

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The portion of country botanically explored last year is indicated in the accompanying map by the red line; the blue line refers to my journey in 1892.

After a few days spent at Gulmarg I started for the Liddar valley, and explored both branches of the river up to their sources. I then crossed over the watershed by the Yamháru pass into the Sind valley, and thence proceeded over the Zoji Lá to Drás. From Drás I travelled by the little-frequented route to Gurais *via* Tilail. From Gurais I made an expedition over the Dorikun pass to the Deosai plains, and returned by the same route. I then went back to India *via* the Rájdiangan pass, Bandipur, Srinagar, and Baramula.

I will now proceed to give a more detailed account of this journey and enumerate some of the more interesting plants that were met with.

After having reported my arrival in Kashmir to the Resident and made all necessary arrangements for an extended tour, I left Gulmarg on the 5th of July for Islamabad *via* Margám and Srinagar. I was delayed for a few days at the latter place owing to the flooded state of the river.

The journey from Srinagar to Islamabad takes about two days by boat. The boats do not, as a rule, go further than Kanbal, which is about a mile below Islamabad. Here there is a rest-house, where I stopped for the night.

On the following day I marched to Aishmakám in the Liddar valley. The path is nearly level all the way. Below Aishmakám the valley is three to four miles wide, and richly cultivated, the numerous channels into which the river divides affording ample facilities for irrigation. The chief crop is rice of several distinct varieties, the varying tints of which are very striking, especially one with deep chocolate-coloured foliage.

The next march is to Pálgam. After leaving Aishmakám the valley becomes much more contracted, the ascent is steeper, and the vegetation alters considerably. Rice cultivation is left behind ; also the chenar tree (*Platanus orientalis*), which forms such a characteristic feature in the villages of the Kashmir valley. Trees belonging to a higher zone now begin to make their appearance, such as *Aesculus indica*, *Prunus Padus*, *Carpinus viminea*, *Acer cæsium*, *Celtis australis*, and a small-leaved form of *Ulmus Walliciana*. *Parrotia Jacquemontiana* is very common for a long distance up the valley. *Rhus succedanea*, (vernacular name "arkora") was also found. Two shrubby species of *Indigofera*, viz., *I. heterantha* and *I. atropurpurea* are abundant, as well as *Rubus biflorus* with its snowy white stems, and *Desmodium tiliaefolium*. The white-flowered Himalayan pæony (*Pæonia emodi*) also occurs here. The higher mountain slopes which come into view as we approach Pálgam seem to be more or less thickly clothed with silver fir, spruce, and pine. My camp was pitched amongst the pine trees at the edge of the forest.

The small parasite (*Arceuthobium minutissimum*) is very abundant in this valley, and the majority of the pine trees which I examined were more or less affected. The existence of the parasite can be detected from a considerable distance, as it causes a congested growth of the branches and thus completely alters the habit of the tree, or that portion of it which is being attacked. It is sometimes found on the trunk, but is most abundant on the smaller branches, surrounding them with a moss-like covering. It flowers in September. The plant is dioecious, and the male and the female plants form separate colonies.

I arrived at Pálgam on the 15th of July. The village is situated a short distance above the junction of the two branches of the Liddar, and the elevation is about 7,000 feet above the sea.

On the 17th I took a portion of my camp to a place called Kainmal, a small marg about 3,000 feet above Pálgam on the east side of the valley. After three days and three nights of incessant heavy rain I managed on the fourth day (July 21st) to collect a large number of interesting plants up to about 12,000 feet.

The condition of the forests in this valley, like that of many others in Kashmir, is an instructive exhibition of the results of allowing every sound principle of forest conservancy to be violated. In spite of the excellent work already accomplished by the forest officer whose services have been lent to the State, a great deal of needless damage is still being committed by gujars and shepherds. As an instance, I may mention what was specially noticeable at Kainmal,

*viz.*, the wholesale destruction of birch trees for the sake of the foliage, on which the shepherds feed their sheep and goats. I have seen similar results of this practice in other localities, but nothing to equal in extent the wholesale destruction of trees which has been taking place on the hill sides above Kainmal. The forest officer is fully aware of the fact, and I notice from his report on the Kashmir forests for 1891-92 that steps are being taken to prevent any further destruction.

I returned to Pálgam on the 22nd of July, and after halting there for one day I made a short tour in the direction of Amarnáth. Ascending from the right bank of the Shisha Nág branch of the Liddar, I had my camp pitched near some gujar huts, a short distance below the Chatponsál ridge, at an elevation of about 10,000 feet. There are some fine clumps of maple (*Acer cæsiwm*) at this spot; otherwise, owing to its southern aspect, there is very little forest growth on this side of the Liddar valley.

The next day I crossed over into the Masjid valley, the stream from which joins the western branch of the Liddar near the village of Aro. A large number of very interesting plants were collected up to 13,000 feet. I was encamped that night just below the pass at the head of the Masjid valley. A shrubby kind of juniper, which is plentiful at this spot, is the only kind of fuel.

I went over the pass on the following day by a path which is rather difficult in places. The summit is about 13,500 feet. The descent on the further side is into the Sangam valley, near the head of which is a large lake; the stream from this lake joins the Amarnáth branch of the Sind river a little to the south of Báltal.

Leaving the Sangam valley on the southern side I had to cross another pass over 14,000 feet, intending to reach Astán marg; but bad weather came on, and we missed the path. We had therefore to make the best of our way down a steep valley until we reached a possible camping ground. When the mist cleared, I found that we had got into a nála immediately above Tanin in the Liddar valley. Both sides of this nála are thickly clothed with what might have been fine forests of birch, but the leaf-bearing branches had all been lopped for sheep fodder, and only the bare white trunks remain.

A short march through beautiful scenery brought us to Tanin the next day. After passing Harwat, a gujar camping ground, where the stream from the Astán marg valley comes in, the path

leads through a forest of spruce and silver fir, with maple, hazel, elm, and *Prunus Padus* here and there intermixed.

I remained at Tanin on the 29th, and left on the following morning for Shisha Nág, at the head of the Liddar valley. This is the pilgrim road to the famous cave at Amarnáth. There is a steep ascent from Tanin of about 1,000 feet through forest of birch and maple, after which the path traverses some grassy slopes at a considerable distance above the river until the camping ground of Zojpal is reached. I sent my camp across the river from here to a place called Badzulkod, where two nálas, very promising-looking for botanical exploration, open out, and went on myself up the valley to Shishá Nág, about three miles distant. This lake is about 12,500 feet above the sea, and lies at the base of an amphitheatre of bare precipitous mountains of a reddish colour streaked with black. There was a great display of flowering plants round about the lake, the majority of them of the ordinary kinds met with in Kashmir at this elevation.

The two days during which my camp remained at Badzulkod were spent in exploring the two small valleys alluded to above. The Sonsár nála, the one to the east, was visited on the first day. There is a fairly good path all the way up along the western side of this valley, which ultimately leads over a high pass into the Wardwán valley. After a rather steep ascent from the camping ground in an easterly direction, the valley takes a turn towards the south, and a small lake comes into view at an elevation of about 13,000 feet. There is a glacier at the upper end of the lake. Many interesting specimens were gathered on the cliffs forming the eastern side of the valley, and on the swampy ground near the lake.

The following day (August 1st) I spent in the Badzulkod nála. There is a small glacier at the head of it, the streams from which spread out in branches through a wide expanse of marshy ground, and here many interesting plants were collected. The deep pink colour of the flowers of *Epilobium latifolium*, which grow in masses on the moraine debris, was a striking feature in the landscape. Several rare plants were found also on some high perpendicular cliffs above the glacier.

On the 2nd of August I marched to within a few miles of Pálgam. After crossing the Liddar by the permanent snow bridge a little below Zojpal, I kept along the right bank as far as the bridge at Práslang, and thence to camp on the left bank. The vegetation on this side of the valley is remarkably luxuriant; for, in addition to the circumstance of forest growth being much more dense on slopes facing the north, the low-lying ground by the river is unusually moist,

and many of the ordinary herbaceous plants, such as species of *Aconitum*, *Delphinium*, *Dipsacus*, etc., attain to gigantic dimensions.

I left Pálgam on the 6th of August, and encamped on a pine-covered ridge above the village of Aro on the western branch of the Liddar. There is a fine view from here looking up the Masjid valley and of the lofty peaks of Gwáshbrari, the highest of which is nearly 18,000 feet.

I went up the valley the next day to Liddarwat, a very beautiful place surrounded by immense precipices of limestone. My camp was pitched in a dense forest of silver fir. The upper part of the valley beyond Liddarwat is called Kolahoi, and here there are some fine glaciers from which this branch of the Liddar takes its rise. I explored this part of the valley on the 8th of August up to the foot of the glacier. On returning down the valley I observed some Gujars drying the leaves of *Taraxacum officinale*, which they told me they ate as a vegetable and also used medicinally as a tonic. They called the plant *hendi*.

From Liddarwat I went over the Yamháru Pass into the Sind valley. The path turns up a small valley towards the west in the direction of the high-level lakes, Már Sár, Tár Sár, and others. My first halting-place was on a ridge about four miles to the east of Tár Sár. I explored some very interesting botanical ground near this place up to nearly 14,000 feet.

I crossed over the pass on the 12th. With the exception of the last 500 feet the ascent is quite easy. I saw some very fine examples of *roches moutonnées* at the head of the valley leading to the summit, also several rocks with polished and furrowed surfaces.

Many rare and interesting plants were collected near the top of the pass, the elevation of which is about 13,000 feet.

The descent to Kullan on the northern side is very steep, and the path is extremely slippery, especially in wet weather. All this side of the Sind valley is densely clothed with forest from about 12,000 feet to the base of the valley. The *Kut* plant (*Saussurea Lappa*) is abundant between 10,000 and 12,000 feet; also *Inula Royleana* with its immense heads of yellow flowers.

At Kullan I had to halt for one day to re-arrange loads and attend to the numerous botanical specimens which had been collected up to that date. I then went up the valley to Sonamarg, from which place I visited the Tájwáz valley, where many valuable specimens were collected. Between Sonamarg and Báltal the road passes through a forest composed of *Pinus excelsa*, *Populus ciliata*, and willow. I noticed that many of the pines were much injured by the attacks of the minute parasite, *Arceuthobium minutissimum*.

I left Báltal on the morning of 20th for the Zoji Láz, and pitched my camp at the entrance of the Kainpatri nála, from which one of the principal sources of the Sind river takes its rise. I ascended this nála in the afternoon as far as the moraine of the central glacier and collected many specimens.

On the following day (August 21st), after crossing the watershed which divides the Sind valley from that of the Drás, I proceeded to Mataiyan, and arrived at Drás on the 22nd.

The Zoji Láz is remarkable for being the lowest depression in the great chain of mountains extending for about 300 miles from Khágán on the west to the eastern sources of the Chenáb. The height of the pass is only 11,500 feet, and by it we step, as it were, on to the high level country of Ladák. By whichever pass we cross to the north of this great chain of mountains, a very conspicuous change in the vegetation cannot fail to be observed.

I halted for a few days at Drás in order to make myself acquainted with the surrounding vegetation, which, though scanty, is very interesting. An expedition I made to the Lamchan nála, a wild-looking rocky gorge on the opposite side of the river, fully rewarded me for all the toil and trouble which had to be undergone. The locality, as seen from a distance, presents a most unpromising appearance, but after climbing for a long time over loose boulder debris, which fills up the entire bed of the ravine, I was fortunate in securing a great many rare and interesting specimens. Some of these, such as *Oxygraphis polypetala*, *Delphinium Brunonianum*, *Corydalis crassifolia*, *Geranium polyanthes*, and *Allardia tomentosa*, were growing amongst the boulder debris, beneath which glacier water was trickling, though not visible. The higher we ascended, the more varied and interesting the vegetation became, until we reached an elevation of about 12,000 feet, above which no vegetable life was visible—nothing but rock, and the evidence of havoc wrought by avalanches of rock and snow.

From Drás I travelled to Gurais *viâ* Tilail. Although this is the most direct route, it appears to be very little used as a trade thoroughfare. Two passes have to be crossed, one leading over to the head of the Tilail valley, and the other over the ridge between Tilail and the Burzil valley. The former is between 13,000 and 14,000 feet high; and, like the Zoji Láz and the Dorikun and Kamri passes, is a depression of the great mountain chain which traverses Kashmir from north-west to south-east. The ascent on either side is very gradual. The other pass leading to the Burzil valley is about 12,000 feet only, but it is much steeper and very difficult for laden ponies in wet weather, especially on the Burzil valley side. By

continuing the road through the narrow gorge of the Kishenganga valley, which opens out a few miles to the east of Gurais, the latter pass could be altogether avoided, to the great advantage of both man and beast.

Starting from Drás the road leads up a valley towards the west. It is fairly good until after passing the villages of Holál and Mushki; beyond this the ground is steep and rocky, and rather difficult even for coolies. The baggage ponies had to be taken across to the right bank of the stream, and by a steep zigzag path along the face of an old glacier moraine to the village of Battakulan where it joins the other path. The elevation of Battakulan is between 11,000 and 12,000 feet. It lies on the left bank of the stream, and is sheltered by enormous promontories of moraine debris. There are no other villages above this.

After halting here for the night, I went on up the valley the next day to a camping ground called Rimochama. The valley opens out very considerably above Battakulan. The ascent is very gradual, and the gently flowing stream forms many channels with intervening islands covered with *Hippophæ salicifolia* and different kinds of willow. A species of *Ephedra* (*E. Gerardiana*) is very abundant and conspicuous with its scarlet berries, and the hill sides are tinged with the crimson autumnal tint of *Polygonum tortuosum*.

As this part of the country has been very little explored, except for sport, I determined to make very short marches. Owing to the small amount of traffic along this route, and the abundant snowfall during the winter months, there is no well-defined track above Rimochama; and what there is, follows the bed of the stream which has to be forded several times. There was a good deal of snow forming vertical walls on either side of the stream. This is named the Koorudgi stream in the Atlas Sheet No. 28, but the name given to me for the valley above Battakulan was Chatpáni. There is a fine mass of bare precipitous peaks at the head of the valley.

We had now reached an elevation of about 13,000 feet, and as the ground looked very promising for botany, I decided to halt here for the night, so as to have the whole of the next day for studying the vegetation of the pass. I collected a great number of plants and seeds that evening at the head of the valley.

The next day (August 30th) was beautifully fine, with a cloudless sky. The top of the pass was soon reached by a steep but easy path over turf. The elevation of this pass is close under 14,000 feet. I can find no name given for it in any maps, but it is known by the Drás people as the Kargeh pass. The view looking down

the valley towards Tilail, is very fine, with Nanga Parbat in the distance. On the pass itself there was very little snow, and the turf was studded with brilliantly-coloured alpine flowers.

A short distance below the pass, on the Tilail side, is a small lake about 300 yards long and 100 yards wide. Some very interesting specimens were collected round the shores of this lake, and on the debris-covered slopes on either side. The stream which issues from this lake is one of the sources of the Kishenganga river.

My intention was to have marched on this day as far as Abdulán, which is the highest village on the side of the pass; but, owing to the swollen state of the stream, I had to halt for that night at a place about two or three miles above the village. The next day, after crossing the stream to the left bank, we had to ascend along the side of the valley for several hundred feet, as the snow bridges over the river had given way. This part of the road is a very difficult one for laden ponies.

Abdulán is a small village, consisting of twelve houses. The elevation above the sea is about 10,500 feet. There is a good deal of cultivation around the village, consisting chiefly of barley and buckwheat. The former was then being harvested, and the buckwheat was looking very promising. A few miles below Abdulán is another village, called Gujeru, where the path crosses the river by a bridge.

The road now keeps along the right bank all the way down the valley, which for several miles extends almost due west. The two sides of the valley are remarkably different in regard to the character of the vegetation. The hill sides exposed to the north are thickly clothed with forest, whilst the opposite sides are almost bare of trees, with the exception of occasional stunted specimens of pencil cedar, and the vegetation resembles that of Baltistán.

The valley becomes very much wider below the village of Gujeru, and there is a large extent of cultivated ground on either side of the river, with numerous small villages scattered here and there. I managed to get as far as Bariáb on this day (31st August). This village is prettily situated near the junction of a tributary stream from the north. On the opposite side of the main valley is the Ráman Sind nála.

I left on the following morning for Baragám, a village about 500 feet lower down the valley. Some portions of the road are decidedly dangerous for ponies, and the loads had frequently to be taken off and carried by coolies. The erection of a few bridges across the river would obviate all such difficulties.

I was much struck with the large amount of land cultivated and available for cultivation in this portion of the valley, as well

as the excellent appearance of the crops, consisting chiefly of barley, *chena*, and buckwheat. The construction of a proper road between Drás and Gurais, *viâ* Tilail, would be the means of developing very considerably the capabilities of this valley as a source of supply to less-favoured districts. There are only two places where any serious obstacles would have to be overcome, *viz.*, just below the village of Battakulan on the Drás side, and the narrow gorge of the Kishenganga between Tilail and Gurais.

The elevation of Baragám is about 9,000 feet. The principal crop is buckwheat, of which two kinds are grown, *viz.*, *Fagopyrum esculentum* and *F. tataricum*. I also saw fields of *chena* (*Panicum miliaceum*), and of a variety of mustard. All the grass and weeds on the hill-sides were being cut and stacked as fodder for winter use. My next halting-place was Zargei. The flat ground by the river is covered with a dense jungle of willow, and a little lower down the valley narrows suddenly into the precipitous gorge leading to the Burzil valley.

The officials in this part of the valley gave me a good deal of trouble by their unwillingness to provide transport and supplies. They are very independent and somewhat insolent in their manner, the result, no doubt, of the inaccessibility of the place.

The next day (4th September) I went over into the Burzil valley, and encamped near the village of Surwán. The path leaving the Kishenganga valley about a mile below Zargei village, turns up the Barnei nála towards the north, and after a gradual ascent for two or three miles, a steep zigzag climb brings you to the top of the ridge overlooking the Burzil valley. There is a grand view from here of the Tilail valley, and of the snowy peaks in the neighbourhood of the Kargeh pass. The northern slopes of this ridge are, as usual, well clothed with forest. The descent to the Burzil valley is through forest all the way, and the path is a very steep one. The village of Surwán is on the left bank of the Burzil stream, and on the opposite side is the road to Gilgit. I reached Gurais on the following day.

What is known as the Gurais valley is in reality only a wide stretch of the Kishenganga valley. It is about four miles long and one mile across in some parts. The slopes facing the north are covered with spruce and silver fir, and pine trees form an irregular belt below. On the opposite side are steep limestone mountains, which rise to over 6,000 feet above the valley. Scattered here and there on the cliffs are a few juniper trees, and the lower slopes are covered with *Artemisia maritima*, which gives the

northern side of the valley that peculiar grey-glaucous appearance so characteristic of the scenery of the dry country around Astor and Gilgit.

At the lower and western end of the Gurais valley, where the river begins to turn southwards in the direction of Kanzalwán, is a remarkable forest composed chiefly of the white poplar (*Populus alba*); and about a quarter of a mile lower down the valley, and on the same side of the river (the left bank), there is a similar piece of forest. The trees are growing close together, and when viewed from the steep hill above, their tops present a level mass of compact foliage, a few individual trees projecting here and there. The chief interest attached to this forest is the large size of the trees, their average height being over 100 feet. Mr. W. Mitchell, who happened to be at Gurais at the time, kindly assisted me in making some measurements. The largest specimen we could find was 127½ feet high and 16 feet in girth at 7 feet from the ground. In the "Forest Flora of North-West and Central India," Sir D. Brandis gives the maximum size of *Populus alba* in India as 40 feet in height and 8 feet in girth.

The undergrowth of this forest is composed chiefly of a tall, handsome *Senecio* (*S. chenopodifolius*) and a low-growing kind of bramble. A few isolated specimens of pine, spruce, and silver fir are met with; also *Populus ciliata*, two species of willow, *Crataegus Oxyacantha*, *Viburnum foetens*, and *Hippophae rhamnoides*; this latter forms large thickets a little higher up the valley.

After a short stay at Gurais, I made an expedition to the Shersár lake on the Deosái plains. As far as Chilam, on the further side of the Dorikun pass, the new Gilgit road is followed, and from there a path up the Balsir valley leads direct to the lake. On the first day I went as far as Bangla, where the road from the Kamri pass comes in, and thence to Minimarg at the junction of the Nagai river. This is really a larger stream than the Burzil before they become united. It rises near the pass leading over into the Shingo valley. There are a few houses at Minimarg, and some cultivated fields where buckwheat is grown. The elevation is about 10,000 feet.

I made a short march on the following day (September 13th) to Burzil, and in the afternoon I was able to explore some good botanical ground along the path leading direct to Skardu from here. Several interesting plants, as well as seeds, were collected up to about 12,000 feet. The rock here is granite.

I went over the pass on the 14th to Chilam, a distance of eighteen miles. This is rather a long march, but perfectly easy when the

snow is off the ground. The most striking feature to be noticed at this time of the year is the brilliancy of the autumn tints produced chiefly by the abundance of two or three species of dwarf willow, and by the pink and scarlet blossoms of *Polygonum affine*. Some interesting plants were found near the summit of the pass, and one in particular, *viz.*, a variety of *Primula Stuartii* with cream-coloured flowers, which I had not known of before. Some seed of this was secured, also of *P. rosea*, which is very abundant here. The elevation of the pass is 13,500 feet. There is a long descent of about 2,000 feet to Chilam. There is no village here, but a rest-house has been built close to the stream which comes down the Balsir valley, the main stream being a branch of the Astor river. On the right bank, just before reaching Chilam, a fine piece of pine forest is passed.

The Shersár lake was reached on the following day (15th September). There is a fairly good path up the Balsir valley over undulating grassy slopes and across numerous deeply-cut water-courses. It is, however, quite easy for ponies. As no fuel is obtainable in the neighbourhood of the lake, I had to collect a pony-load of it on the way up. The stream is thickly fringed with willow bushes on both sides. The Chuchor Lá, or the pass leading over to the Deosai plains, is a narrow grassy depression of the mountain chain which forms the western boundary of the great plateau. On reaching the summit, the view which suddenly presents itself is a very striking one. The big lake occupies the foreground with a low range of rocky hills behind, and to the left of the lake there is a good view of the undulating grassy plateau stretching away to the base of the lofty chain of the snowy peaks in the direction of Skárdu. The lake must be about six miles in circumference, judging from the time it took one of my Gurais coolies to walk round it on the evening of my arrival.\* The lake is very deep, and is said to contain fish. I was told, however, that the capture of fish out of this lake was immediately followed by a violent storm. During the time I was there the weather was abnormally warm for the elevation, and the absence of any sounds, excepting the occasional shrill cries of marmots, was almost overpowering.

A few interesting plants were gathered near the shore of the lake, but the vegetation generally was in a dried-up condition. I noticed many plants still in flower, which on being handled crum-

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\* The object of his excessive energy was to win a bet he had made with one of the other coolies.

bled to dust. This condition of the vegetation is not unusual at high elevations, where early and sudden frosts take place in a still air.

I returned to Chilam the next morning, and on the following day (17th) crossed the Dorikun pass in a storm of wind and sleet, and reached Minimarg the same evening. I halted here for a day to dry the tents, and this gave me an opportunity of exploring some forest ground on the further side of the stream. The most interesting discovery here was that of *Pyrola secunda*, a species which had not been recorded for India previous to my finding it in the Astor valley in 1892. The undergrowth in this forest is composed chiefly of a variety of *Rubus niveus*, with red fruit tasting exactly like that of the raspberry, and of black-currant bushes with their branches bent down with the weight of the fruit. Another kind of bramble (*R. saxatilis*), with scarlet fruit, is also abundant here. The natives call it "*popé*." A large number of interesting mosses were collected here.

From Minimarg I marched to Gurais, and, after halting there for a few days, returned to Srinagar by the Pájdangan pass, and thence to India *viâ* Baramula and Murree.

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SAHARANPUR,

The 6th August 1894.

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*Notes on some of the Economic Plants met with in Kashmir, and  
in the districts of Baltistán and Gilgit.*

As my tours in Kashmir during the last two years were made chiefly through mountainous and uncultivated portions of that country, I had not many opportunities for studying the more important agricultural crops. These, however, will be fully described by Mr. Lawrence in his forthcoming settlement report.

The following information is taken mainly from notes made during these tours. I have been careful, as far as possible, to avoid the repetition of facts already recorded in the Dictionary of Economic Products.

*Abies Webbiana*, Lindl., *var. Pindrow*—(Silver fir).—One of the principal constituents of the high elevation forests, called *kátul* in the Naltar valley, north of Gilgit.

*Abutilon indicum*, G. Don.—Common in the valley, where the fibre is much used.

*Aconitum ferox*, Wall., var. *moschatum*, Bruhl, M. S.—This plant which has a strong musky odour, like that of *Delphinium Brunonianum*, is regarded by Mr. Bruhl as a new sub-species or variety of *A. ferox*. The flowers are of a brownish colour and covered with viscid hairs. I found it growing on rocks in the Musjid valley at about 12,000 feet, and on similar rocks in the Sonsal nála at from 13,000 to 14,000 feet.

*Aconitum heterophyllum*, Wall.—A very common plant in Kashmir, especially on the open margs. It is called "*manguádu*."

*Aconitum Lycotconum*, Wall.—Abundant in forests between 8,000 and 12,000 feet. The flowers are sometimes musk-scented.

*Aconitum Napellus*, L.—(Monkshood).—The following varieties were met with:—

- Var. *dissectum*,—Baltistan, 11,000 to 12,000 feet.
- „ *multifidum*, Dorikan pass, 11,000 to 13,000 feet; Baltistan, 13,000 to 14,000 feet; Gilgit district, 10,000 to 11,000 feet.
- „ *rotundifolium*—Astor valley, 11,000 to 12,000 feet.
- „ *spicatum*—Kashmir, 9,000 to 11,000 feet; Baltistán, 11,000 feet.
- „ *tauricum*—Baltistán, 13,000 feet.

Mr. Bruhl, who is at present engaged in the preparation of a monograph of the *Ranunculaceæ*, was kind enough to identify the above.

*Actæa spicata*, L. (Baneberry).—Common in forests on the Pir Panjál and Kájnág ranges between 8,000 and 12,000 feet.

*Althæa rosea*, L. (Hollyhock).—Abundant in the neighbourhood of villages in the Astor valley, where it is called "*Chamma*". It is much used for planting on graves.

*Andropogon Gryllus*, L.—Called "*pakhor*" in Astor valley. Used as fodder.

*Anemone obtusiloba*, Don.—A common plant in Kashmir, and very variable both as to habit and in the colour of the flowers. A dwarf variety with bright yellow flowers is found at high elevations.

*Apocynum venetum*, L.—Found on the banks of the Naltár stream above Nomal in the Hunza valley. Dr. Aitchison in his "Notes on the Products of Western Afghanistan and Persia." page

13, states that the annual shoots of this plant yield a fibre, from which the Turcomans to the east of Bokhará prepare twine and ropes, and that the bark of the underground stems is employed in tanning, and for the preparation of skins intended for holding water.

*Arenaria holosteoides*, Edgew.—A common weed in wheat-fields in Baltistán. It is eaten as a vegetable.

*Artemisia maritima*, L.—A characteristic plant of Baltistán and of the valleys in the Gilgit district. In the Bulletin of the Royal Gardens, Kew, for June 1893, there is a notice of this plant under the heading of "Wormwood as a Fodder Plant," together with a report by Professor A. H. Church, F. R.S., on a chemical analysis undertaken by him of a sample which I collected in the Astor valley in 1892. The following is his report:—

"I have submitted the sample to analysis, mixing the material together as uniformly as possible. The harsh, woody texture of the plant and its powerful but sickly odour would not commend its use as the chief ingredient in horse fodder; but its chemical composition turns out more favourable than I expected. I think it is extremely probable that the aroma of this plant is chiefly due, like that of common wormwood, to *absinthol* ( $C_{10}H_{16}O$ ), a liquid isomer of camphor. But a bitter principle called *absinthin* ( $C_{40}H_{58}O_9$ ), which is found in *Artemisia Absinthium*, has the smell of wormwood and may be present in the present plant; to separate it and identify it would, however, require a large quantity of material.

"Percentage composition of *Artemisia maritima*—

Water . . . . .	13'6
Oil, resin, wax, etc. . . . .	4'2
Starch, sugar, gum, etc. (by difference) . . . . .	34'2
Albuminoids (true) . . . . .	6'0
Fibre . . . . .	33'9
Ash (includes 2'7 of sand and mica) . . . . .	8'3

"It should be mentioned that the 4 per cent. set down as oil, resin, wax, etc., consists of the matters extracted by ether, of which it was found that three-fourths were soluble also in very strong alcohol, and were consequently for the most part resinoid and aromatic compounds. The albuminoids were determined by the phenol method: had they been calculated from the total nitrogen found, they would have appeared higher (8 per cent.).

"This plant contains rather less albuminoids, less digestible carbohydrates and more fibre than the average hay of mixed grasses.

"It is, however, thrice as rich in albuminoids as the straw of European cereals, which contain about 10 per cent. more fibre than this *Artemisia*."

Dr. Aitchison, in his "Notes on the Products of Western Afghanistan and Persia," page 15, alludes to this species and *A. campestris* as existing everywhere over the dry and stony country, and forming the chief fodder for cattle on those arid tracts. He also says that camels and donkeys thrive on this fodder, and that the horses of the country seem to relish and fatten upon it.

*Artemisia scoparia*, W. and K., Vern. "Zha" in the Astor valley.—Used as fodder.

*Avena sativa*, L. (Oats), Vern. *Shashier* (Astor valley), *Shiasha* (Satpur valley near Skárdu), *Yupo* (Indus valley below Skárdu).

*Berberis Lycium*, Royle.—Abundant in the lower valleys; called "kandach" in the Sind valley.

*Berberis vulgaris*, L. (common Barberry) and varieties.—Plentiful in Kashmir and Baltistán up to 12,000 feet.

*Betula utilis*, Don.—Called "Jeonji" in the Naltar valley north of Gilgit, and the bark is known as "buraj."

*Brassica campestris*, L., var. *Rapa* (turnip).—Called "Gonglu" in the Satpur valley above Skárdu.

*Capparis spinosa*, L.—Rocks in Baltistán and in the Gilgit district.

*Cichorium Intybus*, L. (Chicory).—A common weed in the valley.

*Cnicus arvensis*, Hoffm.—The fresh plants of this species are used in the Indus valley near Skárdu for manuring tobacco crops. It is there called "kanish."

*Corydalis Govaniana*, Wall.—Common at high elevations along the edges of water-courses.

*Corylus Colurna*, L. (Himalayan hazel).—Common in the forest between 8,000 and 12,000 feet.

*Dictamnus albus*, L.—Kashmir and Baltistán, 8,000 to 9,000 feet.

*Datisca cannabina*, L., vern. "Akalbir."—Burzil valley, 9,000 feet; Astor valley, 7,000-8,000 feet; called "bhong" in the Astor district.

*Delphinium Brunonianum*, Royle.—11,000 to 14,000 feet.

*Delphinium denudatum*, Wall.—5,000 to 8,000 feet.

*Delphinium speciosum*, M. Bieb., var. *ranunculifolium*; vern. "Nil" or "zornil."—Forests in the Liddar valley, 10,000 to 12,000

feet. I was told by Gujars that the root of this plant is very poisonous to cattle. I am indebted to Mr. Bruhl for its correct identification.

*Fagopyrum esculentum*, Moench.—(Buckwheat); vern. "*Pháphra*" or "*ogal*."—Widely cultivated in Kashmir and Baltistán.

*Fagopyrum tataricum*, Gaertn.—(Buckwheat); vern. "*Trumba*" and "*chini troma*" (Sind valley).—A hardier and more robust species and grown usually at higher elevations. I have frequently seen both kinds in the same field. The buckwheat harvest varies according to the elevation; in the Tilail valley, at 10,000 feet, it was being cut on the 1st of September.

*Ferula Jaeschkiana*, Vatke; vern. *Ápatkanphur* (Sind valley), *kángwa* (Pir Panjál).—A tall, handsome, umbelliferous plant, with yellow flowers, abundant in most of the valleys in Kashmir. This plant was at one time supposed to be a source of "*asafætida*." It resembles *F. Narthex*, Boiss, but has much larger fruit. The plant is said to be eaten by sheep and goats.

*Ferula Narthex*, Boiss., Syn. *Narthex asafætida*, Falc.—Abundant in the Astor valley below Doian. I remember when on my way to Gilgit noticing this plant, only the dry bleached stems being then visible. There is a specimen in the Saharanpur herbarium collected by Dr. Giles in 1886, and probably from the same locality. I agree with Dr. Aitchison in considering this to be the plant which Dr. Falconer supposed to be the true source of the drug. The root is full of a resin which has a powerful scent of *asafætida*. The plant is figured in the Botanical Magazine, t. 5168, and in Bentley and Trimen's Medicinal Plants, t. 126.

*Fraxinus xanthoxyloides*, Wall.—Called "*Kásuna*" in the Naltar valley north of Gilgit.

*Gossypium herbaceum*, L., called "*khaians*" in the Hunza valley north of Gilgit.

*Hordeum vulgare*, L. (Barley); vern. "*Wiska*" (Sind valley), "*nas*" (Baltistán), *Yo* (Naltar Valley north of Gilgit).

*Indigofera Gerardiana*, Wall., var. *heteranatha*.—An abundant plant in Kashmir up to 9,000 feet, growing gregariously in most of the lower valleys. It is called "*send*" in the Sind valley. Its twigs are much used for basket-work; and occasionally for the construction of rope bridges.

*Iris Sisyrinchium*, L.—This is the small blue-flowered species so common in the valley. The foliage is largely used as fodder.

*Iris Kashmiriana*, Baker.—A large, handsome species, much used for planting over graves.

*Faeschkea gentianoides*, Kurz.—Common in Kashmir. The whole plant is extremely bitter, much resembling *chiretta* in taste.

*Juniperus macropoda*, Boiss.—(Pencil Cedar).—A characteristic tree of Baltistán, also found in Kashmir on hill-sides exposed to the south. Called "*chili*" in the Astor valley, and "*shupa*" in the Shingo valley.

*Lathyrus sativus*, L., called *Gharás* in the Satpur valley above Skárdu.

*Medicago sativa*, L. (Lucerne).—Apparently wild in many parts of Kashmir and Baltistan. Called "*Rishka*" in the Astor valley.

*Megacarpæa polyandra*, Benth.—A very singular looking Cruciferous plant, with tall thick stems and large flat seed-pods. It is extremely abundant in the Kamri valley up to 12,000 feet, and I have also met with it on the hill-sides above Gulmarg. The leaves are much sought after by the natives, who use them as a vegetable. The plant is known under the names "*Chach*," "*Chatri*," and "*Chat-tarhak*."

*Melilotus alba*, Lamk.—Called "*Bish ishpit*" in the Astor valley.

*Melilotus officinalis*, Willd.—Called "*Ishpit*" or "*ispit*" in the Satpur valley above Skárdu.

*Mentha sylvestris*, L., var. *Royleana*.—Used as fodder in the Astor valley, where it is called "*Pillil*."

*Morus* sp.—The "*Sháh tut*" of the Skárdu district; also called "*kachilosa*." Fruit large, black, and very juicy.

*Myricaria elegans*, Royle.—River beds in Baltistán, where it is known under the name of "*Umbu*."

*Myricaria germanica*, Desv.—River beds in Kashmir and Baltistán.

*Nicotiana rustica*, L. (round-leaved tobacco).—Grown to some extent in the Indus valley below Skárdu, at an elevation of about 8,000 feet.

*Oryza sativa*, L. (Rice).—Two distinct classes of rice are grown in the valley, the red and the white, with many varieties of each. The red varieties, though less esteemed, are more commonly cultivated on account of their being more hardy. (See Dictionary of Economic Products of India, Volume V, page 622).

*Pæonia emodi*, Wall.—Common in the Liddar valley.

*Panicum miliaceum*, L., vern. "*Chena*".—Extensively cultivated in the Tilail valley, where it is called "*chini*."

*Parrottia Jacquemontina*, Dene.—A gregarious shrub, abundant in all the valleys south of the Central Kashmir chain of mountains up to 8,000 feet.

*Physochlaiana præalta*, Hook. f.—Abundant in the vicinity of villages. Captain Yielding informs me that several ponies belonging to one of his contractors died last year from eating a certain plant called “*langtan*” at the village of Minawar near Gilgit. Judging from the description given to me, I am inclined to believe that this is the plant alluded to.

*Pinus excelsa*, Wall.—(Blue pine or *chil*).—Abundant all over Kashmir, and usually forming the outer or lower belt of the forests of spruce and silver fir. In almost every instance where I have seen this tree growing in any quantity, the minute *Loranthaceous* parasite, *Arceuthobium minutissimum*, has been detected. The native name for *Pinus excelsa* in the Astor valley is “*chui*”; and in the Shigar valley in Baltistán it is called “*Showi*.”

*Pinus Gerardiana*, Wall.—Abundant between 8,000 and 9,000 feet in the Astor valley, where it is called “*Garol*.”

*Pisum sativum* L. (Pea).—Called “*Kukan*” in the Satpur valley above Skárdu; also “*stranma*” in other parts of Baltistán.

*Podophyllum eriodi*, Wall.—Common in forests. The fruit is eaten; vern. “*Wanwanganu*.” In the Naltar valley beyond Gilgit it is called “*ichiya*.”

*Populus alba*, L. (White poplar); vern. “*Pras*” (Sind valley), “*naumer*” (Indus valley near Skárdu). See page 34 for a description of the remarkable forest of white poplar in the Gurais valley.

*Populus ciliata*, Wall.—Called “*Berpar*” in the Shingo valley, Baltistán.

*Prangos pabularia*, Lindl.—Common in the dry valleys of Baltistán. In the neighbourhood of Drás I have seen large stacks composed entirely of this plant which had been collected as fodder for winter use. It is also very abundant in the Tilail valley.

*Rheum emodi*, Wall.—Called “*Pombak*” in the Liddar valley.

*Rhus succedanea*, L.—vern. “*arkora*.”—The wood of this tree is used in the Liddar valley for the manufacture of spoons.

*Ribes nigrum*, L. (Black currant).—Not uncommon in the drier parts of Kashmir and Baltistán. Fruit large and well-flavoured.

*Rosa Webbiana*, Wall.—Vern. “*Sermang*” (Shingo valley, Baltistán), *Singai* (Gilgit district). Abundant in Baltistán and the drier parts of Kashmir. Very showy when in flower.

*Rubus niveus*, Wall.—Several varieties of this occur in Kashmir. One with a large red fruit, and flavoured like a raspberry forms a large portion of the undergrowth in a forest at Minimarg near the Burzil pass.

*Salix*.—Several species of willow are found in Kashmir at vari-

ous elevations. The following vernacular names are used :—" *Yihr*" (Sind valley), "*bium*" (Astor district), "*chakma*" (Satpur valley near Skárdú), "*chanmar*" (Shingo valley, Baltistán).

*Sambucus Ebulus*, L.—(Dwarf elder).—A common weed near villages in the Sind, Liddar, and other valleys of Kashmir.

*Saussurea Lappa*, Clarke; Vern. "*kut*".—Kashmir forests from 10,000 to 12,000 feet. Abundant in the Sind and Burzil valleys.

*Setaria italica*, Beauv.—In the Naltar valley, north of Gilgit: this crop is called "*pirpit*."

*Spiræa hypericifolia*, L.; vern. "*Sáher*" (Baltistán), "*tabalgol*" (Astor district).—Although not included in the "Flora of British India," the economic value of this shrub, as yielding excellent material for small walking sticks has long been known to sportsmen in Baltistán, whose shikaris never fail to collect a supply. My friend, Captain Hunter-Weston, brought back flowering specimens collected in Baltistan in 1890, by means of which the plant was identified. I have since collected it on the Kájnág range, in the Satpur valley above Skárdú, in the Ditchell valley above Gudhai, and more recently in the Burzil valley near Bangla. The wood is very hard, with smooth reddish-brown persistent bark.

*Stipa sibirica*, Lamk.—This, which is known as the poisonous grass of Kashmir, is very abundant in some of the valleys, especially on the outskirts of the forests at an elevation of 8,000 to 9,000 feet. It occurs also in other parts of the Himalaya; and on the Black mountain in Hazara it was the cause of much sickness amongst the baggage ponies during the expedition of 1888. The direct cause of its injurious effects on animals has not yet been conclusively shown. Some attribute it to a narcotic principle inherent in the plant, whilst others affirm that it acts mechanically as an irritant, and is not in any way chemically poisonous. Dr. Aitchison, who has given much attention to the subject, and has witnessed many cases of ponies having been poisoned by eating this grass, believes that the symptoms are produced by some kind of narcotic poison. A common remedy in Kashmir for this complaint, Dr. Aitchison tells me, is to hold the animal's head in the smoke of a fire, in order to produce a discharge from the nostrils, after which the dangerous symptoms disappear, and the animal recovers consciousness. In addition to this treatment, vinegar and sour apples are sometimes given. The cattle of the country do not of their own accord eat this grass during the spring and summer, but in the autumn, Dr. Aitchison says, they do eat it. If this be so, it tells somewhat against the idea of the plant possessing only mechanically irritant properties, for during the autumn months the rough awns of the spikelets are fully developed.

*Taraxacum officinale*, Wigg.—In the Kolahoi valley above Lidarwat, I came across some shepherds who were spreading the leaves of this plant in the sun to dry. They told me that they used them as a tonic as well as a vegetable. They call the plant “*hendi*.”

*Triticum sativum*, L (Wheat); vern. “*Cheor*” (Indus valley below Skárdu). *Kanak* (Satpur valley near Skárdu).

*Vicia Faba*, L. (Bean).—Called “*Bararak*” in Satpur valley near Skárdu.

J. F. DUTHIE,

Director of Botanical Department,  
Northern India.

The 6th August 1894.

### *Note on the Fodder-yielding Plants of the Gilgit District.*

In my report for last year I gave a short sketch of the general character of the natural vegetation of the Gilgit valley, and endeavoured to point out by what means the supply of fodder from this source might be increased.

In order to develop as far as possible the capabilities of the district, two distinct lines of operation must be followed:—

(1) The utilization of the indigenous vegetation; (2) the cultivation of suitable fodder crops.

My stay at Gilgit was not long enough to enable me to make a complete list of the plants of the district. Of those which I did take note of, the following may be considered as more or less valuable for fodder:—

NAT. ORD. CRUCIFERÆ.—The majority of the species belonging to this family might be utilized. They are also to be recommended for their anti-scorbutic properties.

*Lepidium Draba*, L.—This plant is largely used as fodder at Quetta, and its extended growth should be encouraged in the Gilgit district. An allied species, *L. latifolium*, L., is common at Nomal in the Hunza valley.

NAT. ORD. CAPPARIDEÆ—*Capparis spinosa*, L.—The leaves are an excellent fodder.

NAT. ORD. TAMARISCINÆ—*Tamarix gallica*, L.—A common shrub along the beds of streams. It yields a good fodder for camels.

NAT. ORD. RHAMNÆ—*Zizyphus vulgaris*, Lamk.—Sheep and goats are often fed on the leaves of this shrub.

NAT. ORD. LEGUMINOSÆ.—This family is represented by numerous shrubs and herbs, all of which may be safely used as fodder.

*Melilotus officinalis*, Willd., is a common weed of cultivation. *Alhagi maurorum*, Desv., is a well-known camel fodder; and of the genus *Astragalus*, several species are found wild in this district.

NAT. ORD. COMPOSITÆ—*Artemisia maritima*, L.—The most abundant plant on the lower portions of the hill-sides surrounding Gilgit. On page 38 will be found Professor Church's chemical analysis of this plant. *Scorzonera divaricata*, Turcz, is common in the valley; also species of *Lactuca*, *Sonchus* and *Tragopogon*, all of which yield more or less nutritious fodder.

NAT. ORD. OLEACEÆ—*Fraxinus xanthoxyloides*, Wall. is not uncommon in the valleys surrounding Gilgit. The foliage of this tree is used elsewhere for feeding sheep and goats.

NAT. ORD. AMARANTACEÆ—*Digera arvensis*, Forsk., *Amarantus spp.*

NAT. ORD. CHENOPODIACEÆ.—This family is largely represented in the district, and many of the species can be used as vegetable food as well as for animal fodder.

*Chenopodium album*, L.  
 „ *Blitum*, Hk. f.  
 „ *Botrys*, L.  
 „ *hybridum*, L.  
*Atriplex crassifolia*, C. A. M.  
 „ *rosea*, L.  
*Eurotia ceratoides*, L.  
*Kochia prostrata*, Schrad.

NAT. ORD. POLYGONACEÆ—*Rumex hastatus*, Don.

NAT. ORD. SALICINÆ—*Salix acmophylla*, Boiss., and other species

NAT. ORD. GRAMINÆ.—The following is a list of the uncultivated grasses, of which specimens were observed in the Gilgit valley. This list might be considerably added to by including the kinds which occur on the high margs above the valley on either side. In 1892 large quantities of grass fodder were obtained from this source.

*Andropogon annulatus*, Forsk.  
 „ *distans*, Nees.  
 „ *Ischæmum* L. Common at Minawar.  
 „ *laniger*, Desf.  
 „ *Sorghum*, Brot., var. *halepense*.

*Aristida* spp.  
*Avena fatua*, L.  
*Calamagrostis* spp.  
*Eragrostis cynosuroides*, R. and S.  
     „ *poaeoides*, Beauv.  
*Oryzopsis* spp.  
*Panicum sanguinale*, L.  
*Pappophorum persicum*, Boiss  
*Pennisetum dichotomum*, Del.  
     „ *flaccidum*, Griseb.  
     „ *lanatum*, Klotsch.  
*Phragmites communis*, Trin.  
*Poa bulbosa*, L.  
*Saccharum spontaneum*, L.  
*Stipa* spp.

A large number of nutritious plants are rejected by animals on account of their prickly nature ; and, as this is a common character of the vegetation of tracts of country like that of Gilgit, it is obvious that, in order to utilize such plants in the form of fodder, some means must be adopted to disarm them. Their conversion into silage would certainly be effective in this respect, and I have reason to believe that this method of storing fodder would succeed in that climate.

Before leaving Kashmir in 1892, I had an opportunity of discussing with Captain Yielding, D.S.O., the subject of fodder-supply in the Gilgit district. His head-quarters happened at that time to be at Gurais, and I there gave him a memorandum embodying the results of my investigations. I also suggested to him the advisability of making a few silage experiments with the ordinary coarse indigenous vegetation. I understand that arrangements have been made for the preparation of silos at suitable localities, but as yet the results have not been communicated to me.

Several kinds of thistle, and of other plants allied to them, are plentiful in the Astor and Gilgit valleys ; but owing to their being protected by thorns, they are at present unavailable as fodder to many animals. Plants of the thistle tribe are usually highly nutritious. The particular species which I remember to have seen in those valleys in any quantity are—*Carduus nutans*, L., *Cnicus arvensis*, Hoffm., *C. involucratus*, DC., *Cousinia* spp., and *Echinops cornigerus*, DC. These and the widely spread wormwood (*Artemisia maritima*) all belong to the natural order *Compositae*.

The genus *Astragalus* (Nat. ord. *Leguminosae*) is abundantly represented in this district; several of the species are very prickly, and are therefore not eaten by animals. They are, however, capable of adding to the nutritive value of silage.

*The cultivation of fodder crops.*—Owing to the scarcity of water available for irrigation, as well as to the scarcity of labour throughout the Gilgit district, the extent to which cultivation can be carried out is limited. The numerous remains of deserted villages between Bunji and Gilgit show how much the population of this valley has decreased. Until these village sites become reinhabited, it will not be possible, owing to lack of labour, to increase the culturable area to any great extent. Wherever water for irrigation does exist, efforts should be made to encourage the growth of plants likely to be useful as fodder.

Shortly after my return from Kashmir in 1892, a large quantity of grass seed (about seven maunds), of kinds specially selected for the Gilgit climate, was despatched from Saharanpur through Captain Yielding, the Commissariat officer on special duty in Kashmir. I have not yet been informed as to the results of the sowings.

In the following year ten pounds of *Robinia* seed, imported direct from Italy, were forwarded to Captain Yielding. Sowings have been made at various places in the neighbourhood of Gilgit, as well as at Chilás, and the seedlings are now, I hear, two feet high and thriving, except at Bunji, where they were destroyed by mud floods. The successful growth of this tree in the Gilgit and Indus valleys would prove to be an immense advantage. It is a quick-growing plant, and is said to prefer open and barren situations.

Several packets of seeds of the Australian Salt-bush (*Atriplex nummularia*) have also been sent from Saharanpur for trial sowings. Being a desert plant it may possibly find a congenial home in the Gilgit district. It is much valued in Australia as fodder for sheep, especially during seasons of drought.

In addition to the above, a consignment of twenty maunds of lucerne seed (*Medicago sativa*) was sent last cold weather to Captain Yielding for sowing at various localities along the Gilgit route.

J. F. DUTHIE,

Director, Botanical Department,  
Northern India.

SAHARANPUR,

The 6th August 1894.



# RECORDS

OF THE

## BOTANICAL SURVEY OF INDIA

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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### VOLUME I.

No. 4.

NOTES ON A JOURNEY FROM HAVERI TO KUMTA,

BY

G. MARSHALL WOODROW.

NOTES OF A TOUR IN TRAVANCORE, ETC.,

BY

M. A. LAWSON, M.A.



CALCUTTA:

OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1894.



# NOTES

## ON A

### JOURNEY FROM HAVERI TO KUMTA

#### IN

#### MAY 1894.

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Haveri is a town 60 miles south of Dharwar on the Harihar Branch of the Southern Maratha Railway. It is on a good road which crosses North Kanara to Kumta on the coast.

Near Haveri the plains of black soil, which occupy the greater part of the Dharwar Collectorate, change gradually into a yellowish loam, producing scanty crops of cotton and millet. With the exception of stunted *Babool*<sup>1</sup> on the headlands of the fields, planted trees only are to be seen. The fences are chiefly of *Euphorbia Tirucalli*, Linn., and *Opuntia nigricans*, Haw., in them *Olea scandens*, Roxb., and *Cadaba indica*, Lamk., occur, and climbing over them at intervals may be seen *Rivea hypocrateriformis*, Choisy. *Ipomœa sepiaria*, Koen., *Asparagus racemosus*, Willd., *Vitis setosa* Wall., *Dæmia extensa*, Br., and other two *Asclepiads*. Groups of *Balanites Roxburghii*, Planch., may be seen, and *Cassia auriculata*, Linn., is common, but at this season herbaceous vegetation is very scanty, being represented only by *Tribulus terrestris*, Linn., *Cleome simplicifolia*, H. f. and T., *Evolvulus alsinoides*, Linn., *Withania somnifera*, Dunal, and *Trichodesma amplexicaule*, Roth. Of *Trichodesma amplexicaule*, Roth. C. B. Clarke remarks, "it is probably a mere form of *T. indicum*, Br." The general aspect of *T. amplexicaule* while growing is very distinct; it is much smaller than *T. indicum*, the anthers are exserted, and have long twisted points; the corolla lobes are also furnished with long twisted points, and, as far as I have observed, there is also in Western India a difference in the distribution of those two species: *T. amplexicaule* occurring in the Southern Maratha country, Bijapur and Scind, but being absent from Poona district which is occupied by *T. indicum*. The road runs due westward 10 miles to the village Adur, where

<sup>1</sup> *Acacia arabica*, Willd.

*Trianthema decandra*, Linn., is found hanging down the side of a bank. The Marking-nut<sup>1</sup> tree and the Cashew-nut<sup>2</sup> tree appear near the village, evidently planted, and "Mole"<sup>3</sup> grass is abundant in places with defective drainage. This grass much resembles the "sabai" of Northern India, both in general appearance and properties; it is used for making brooms and ropes, and good paper can also be made from it, although the Poona paper manufacturers say it has some knots that are difficult to remove. When this objection has been overcome it will surely become an important source of paper material, as it could be produced in great quantity on water-logged land that is not fit for general cultivation. The roadside trees *Karanj*<sup>4</sup>, *Nim*<sup>5</sup>, and *Jambool*<sup>6</sup> look more luxuriant here than further east, an evident sign of increasing rainfall. From this point the road turns south-west and a few miles further brings in view the village of Alur, with what appeared in the distance to be a large Cocconut plantation, but which on closer inspection proved to be a mixture of Cocconut, Betel-nut, Jack fruit, Betel-leaf, Plantain and other crops that would grow on a wet soil, planted without apparent system; the water in numerous large tanks is only three feet from the surface in May, and the workmen appear worn to skin and bone from fever. *Polygonum barbatum*, Linn. was gathered in ditches in the shade, and *Blumea membranacea*, D.C., with *Hydrocotyle asiatica*, Linn., on the outskirts, and *Hemidesmus indicus*, Br., in ripe fruit on the fences which consisted of *Agave vivipara* and *A. americana* on raised banks, and as an apology for a fence, occasionally, *Jatropha curcas*, Linn. The last three are foreign plants, and this leads to the reflection that foreign plants are very generally used for similar purposes. Here *Cordia Macleodii* H. f. & T., occurs, and a small flowered form of *Carissa carandus*, Linn. begins to appear, and continues many miles towards the coast, occupying places not heavily wooded. Here also begins to appear *Eugenia caryophyllæa*, Wight., which continues at short intervals to within high water mark in the tidal back waters. As it occurs here, the rusty red colour on the back of the leaf is wanting, but there is little doubt about its identity. A few *Ainee*<sup>7</sup> trees also appear here and they occur in increasing numbers till the crest of the Ghauts is reached. Soon after passing Alur, specimens of *Randia uliginosa*, D.C. were gathered: the large white flowers with radiating anthers are specially striking at early dawn; the sweet

<sup>1</sup> *Semecarpus Anacardium*, L.f.<sup>2</sup> *Gymnothrix alopecuroides*, Nees.<sup>3</sup> *Melinis azadirachta*, Linn.<sup>4</sup> *Anacardium occidentale*, L.<sup>5</sup> *Pongamia glabra* Vent.<sup>6</sup> *Eugenia jambolana*, Lam.<sup>7</sup> *Terminalia tomentosa*, Bedd.

perfume and large glossy leaves together with the prolonged flowering season of this plant make it a desirable tree for large gardens or parks. Although, as its name implies, it is a marsh tree, it thrives on well-drained land with a heavy rainfall. Here also, the *Koomba*<sup>1</sup> of the Marathas occurs and continues till near the coast; it was festooned with the dried vines and fruit of *Dioscorea oppositifolia*, Linn. This place is about 5 miles from Sumasgi on the border of North Kanara. The land is high and uncultivated and the jungle sparse; the grass land has a brown loamy soil about 2 feet in depth, and the altitude is about 2,500 feet. Would such land suit *Agave sisilana*? This plant promises to become an important fibre crop, and the earlier that suitable land for it is selected the better. Here also *Bassi*<sup>2</sup> *longifolia*, Linn., is met with and *Ægle marmelos*, Corr. (with a platform built round it as is usual with sacred trees) in company with *Sissum*,<sup>3</sup> *Kursing*,<sup>3</sup> *Heerda*<sup>4</sup>, and *Garuga pinnata*, Roxb.; *Biboas* with *Loranthus loniceroides*, Linn., on it, *Rhus parviflora*, Roxb. and *Holarrhena antidysenterica*, Wall. In the tank at Sumasgi, the *Sola* plant, *Æschynomene aspera*, Linn. is to be seen; it has not hitherto been admitted to our local floras, although it is abundant at Hangal, a few miles northward where it is called *Bhend*, and is used as buoys for swimming. The fringed<sup>5</sup> marsh flower also occurs here, its leaves resembling those of a *Nymphæa*, the floating *Jussiaea*, white and red *Nymphæas*, are abundant, in company with *Ceratophyllum demersum*, Linn., *Oxalis corniculata*, Linn., *Aponogeton monostachyum*, Linn., *Panicum interruptum*, Willd., and *Hydrilla verticillata*, Casp., the latter as usual very abundant, but *Chara fragilis* was searched for in vain. The latter plant has recently been making itself remarkable; for many years previous to 1887 it was superabundant near Poona; but at that date it disappeared suddenly, and is now as far as is known only to be found in Western India at Rutnagiri and at Bodeli in Guzerat. The grand flowering climber, *Ipomæa campanulata*, Linn. now became abundant and continued many miles towards the coast. Here bamboos are planted on the road-sides, *Pterocarpus indicus*, Willd. is common, and isolated trees of *Cassia Fistula*, Linn. were conspicuous by their yellow blossoms. At this part the road is high, and the view westward to the horizon is a waving sea of tree tops. Near the road are grand specimens of *Schrebera swietenoides*, Roxb., (here called *Mokha*) and *Phyllanthus distichus*, Muell., looking very strange in the twilight with its folded leaves—a

<sup>1</sup> *Careya arborea*, Roxb.<sup>2</sup> *Stereospermum xylocarpum*, Wight.<sup>3</sup> *Semecarpus Anacardium*, Lf.<sup>4</sup> *Dalbergia latifolia*, Roxb.<sup>5</sup> *Terminalia Chebula*, Retz.<sup>6</sup> *Limnanthemum indicum*, Thw.

ghost-like tree. A few miles further westwards is Yacombi, 47 miles from Kumta, with a forest guard, a dharmsalla, and a district bungalow in the midst of heavy forest. In a small clearing by a tank, is a splendid specimen of *Ficus mysorensis*, Heyne.; in the tank the yellow flowered *Utricularia stellaris*, L.f. abounds, as do *Pistia stratioides*, Linn., and *Nelumbium speciosum*, Willd.; the mouth of a drain was occupied by a colony of gregarious spiders making a net of their long legs, and it was amusing to see the spiders' net break up and rush into the drain on being disturbed. *Mimosa sensitiva* first appeared here as a road-side weed, and increased greatly in quantity towards the end of the journey. The fences are generally made of *Adhatoda vasica*, Nees.; but in some instances the common rose, named Edward, is used and it appears to grow with great vigour without special care. *Trichosanthes palmata*, Roxb. and *Entada scandens*, Benth. are conspicuous climbers, the latter growing up to the tops of high trees, then hanging down to the ground like an elegant green curtain. *Gensing mara*,<sup>1</sup> a large Bignoniaceous tree, was in ripe fruit on the banks of the tank, and, near by, *Ficus gibbosa*, Blume was abundant. In published descriptions of this small tree, no mention is made of the glandular punctures, irregularly disposed between each pair of primary veins; those punctures are of very constant occurrence in Western India and appear on the youngest leaves, increasing in size with the development of the leaf, but they are not observable on dried specimens; probably those marks are due to insect agency, but I have not been able to prove this. The large epiphytal fern, *Drynaria quercifolia*, Linn., begins to appear here and increases in numbers towards the coast, and large trees of *Vitex altissima*, L. f. and *Vitex alata*, Heyne are abundant. Here also *Mallotus philippinensis*, Muell., occurs, and several species of small leaved *Ficus* are of such great height that it is difficult to identify or get specimens of them. *Vitis discolor*, Dalz. is plentiful in company with *Hemidesmus indicus*, Br. (here called *Dude balli*); which is collected for the market. *Getonia floribunda*, Roxb., *Clematis hedysarifolia*, D.C., and *Cæsalpinia mimosoides*, Lam., and *Chikakaie*,<sup>2</sup> the soap pod, are abundant. *Leea sambucina*, Willd. is one of the commonest roadside plants from this place down to the coast, and *Hoya retusa*, Dalz. hangs in dense masses from the trees. Although all this part of the forest is very heavy, there is great variation in the size of the trees in different parts; in one of the

<sup>1</sup> *Stereospermum chelonoides*, D.C.

<sup>2</sup> *Acacia concinna*, D.C.

heaviest parts, the monarch of the forest is a mango, and there are, near by, great numbers of *Caryota urens*, Linn., showing great variation in the form of the leaflets; some forming a nearly equilateral triangle, others a long narrow wedge; the prevalence of particular forms on certain trees leads one to imagine they are of different species, but this impression disappears on further study. *Pothos scandens*, Linn., in company with a species of *Piper*, is abundant on the stems of trees here, and the coalescence of the stems of *Terminalia tomentosa*, Bedd. and *Lagerstræmia lanceolata*, Wall., is frequently to be seen. Why should those two species coalesce more frequently than others? It would be interesting to cut through one of the stems and watch the result. When Kumta was 45 miles distant, the first example of *Cymbidium bicolor*, Lindl., was met with, its pendulous flower stalks, about eighteen inches in length, were not fully developed. Here was *Wrightia tomentosa*, R. & S., that has caused such diverse statements by authors regarding the colour and odour of its flowers. In this instance—noted 12 hours after gathering—the corolla was a very pale yellow with a greenish tinge, the lobulate scales at the mouth of the corolla tube were orange-coloured and the odour foetid; when first seen in the forest, the corolla was a nearer approach to pure white. *Osyris Wightiana*, Wall. occurs here; and *Dillenia pentagyna*, Roxb., laden with its small yellow fruit, is abundant, here also is the *Nux-vomica* tree—at this season in the height of its beauty with fresh shining foliage, and bright red or yellow fruit. At 37 miles from the coast, *Ixora coccinea*, Linn. was first observed, and it continued down to the margins of the back waters; its colour varies from pale yellow to deep crimson, and it, with the assistance of *Mussaenda frondosa*, Linn., with its pure white bracts, makes the forest gay. *Dalbergia volubilis*, Roxb., *Jasminum arborescens*, Roxb., *Bassia longifolia*, Linn., *Melastoma malabathricum*, Linn., *Smilax ovalifolia*, Roxb., *Garcinia indica*, Chois., and *Schleichera trijuga*, Willd. were the new features of the forest in that locality.

At that place also occurs the first regular plantation of betel-nut palms met with on this journey. The plantation occupies the higher part of a narrow valley evidently having abundant subsoil water, which at the lower part is utilised for rice fields that are moist in the month of May. The plantation is surrounded by broad and deep trenches which serve as drains to catch surface water and to strengthen the fences. The trees are in lines 8 feet apart, and between each pair of lines there is, alternately, a drain and a ridge, the drains being about 18 inches in depth and the ridges of corre-

sponding height, so that each tree stands on a slope ; the distance apart of the trees in the lines is about 5 feet. In this plantation no irrigation is used ; and cattle-dung not being available, the chief manure consists of young branches and leaves from the neighbouring forest ; such manure had recently been laid down on the surface to a depth of about 9 inches ; between the palms cardamoms are grown, pepper vines are trained up the stems, and plantains occupy all odd places. At Sumpkand, 27 miles from the coast, *Gymnema sylvestre*, Br., was found. It was not in flower, so the test of its remarkable property of suspending temporarily the ability to taste sugar was applied ; it has been said also to suspend the power of tasting quinine, and one of the servants, who has been gorged with that useful drug for some days, was made happy in the prospect ; but it proved fallacious, as far as his and my own experience went ; no doubt it did alter the taste of quinine somewhat, but it did not remove its bitterness. This plant is widely distributed on the hill ranges in Western India, but nowhere occurs so abundantly as in the immediate neighbourhood of the district bungalow at Sumpkand, North Kanara. It has not any well-known vernacular name, and its properties were not known to any of the people I met with, who were quite familiar with the properties of *Hemiasmus indicus*, Br. To fulfil an indent for the dried leaves of *G. sylvestre*, I set about collecting and also made the bungalow peon familiar with it, to facilitate the collection of future supplies. It may be worth noting that the coolies employed to gather the leaves were lads, named Gunpa and Jiwa.

The vegetation here shows indications of a decided increase in moisture. Among Orchids *Rhynchostylis retusa*, Blume., *Cælogyne bicolor*, Lindl., *Saccolabium Wightianum*, Hook. f., *Cottonia macrostachys*, Wight., *Pholidota imbricata*, Lindl., *Vanda parviflora*, Lindl., and a few others, occur ; and of ferns, *Blechnum orientale*, Linn., *Stenoloma chinensis*, Swartz., *Gleichenia linearis*, Burm., *Alsophylla glabra*, Hook., *Lygodium microphyllum*, R. Br., *Pteris pellucida*, Presl., *Adiantum lunulatum*, Burm., *Athyrium filix-fœmina*, Bernh. In shady nooks by the road-side, even at this dry season (May), magnificent groups of those ferns may be seen, but *Gleichenia linearis* (like *Pteris longifolia* in other districts) bears full sunshine with impunity. Here was first met with the one solitary example of *Araliaceæ* in Western India, viz., *Heptapleuron Wallichianum*, C. B. Clarke. It is not "a large glabrous tree" here, but a subscandent shrub. Here was a large Jack-fruit tree with over one hundred of its grand golden-coloured fruits nearly ripe, and near it, three specimens of *Amorphophallus commutatus*, Schott, in flower. The roots of the latter were dug up, labelled.

and carried off to Poona to produce leaves. (Those have grown up and prove to be remarkably similar to the leaves of *A. campanulatus*.) Here is also found *Modecca palmata*, Lam., the only representative of *Passifloreæ* in Western India. I had been searching for this plant for a long time, but no exact *habitat* being available on records, I had not found it hitherto. On the Kumta-Sirsi road, from the 15th to the 30th mile from Kumta, it occurs rarely, some plants being in flower, others in fruit. The fruit at this season is an oblate smooth green hollow sphere, about  $1\frac{1}{2}$  inch in width, the seeds scarcely yet beyond the ovular stage. An adjacent shopkeeper informed me that it is called *Iyer balli*, and that the fruit grows the size of the fist, is poisonous, and is used as cattle medicine. The root is greatly swollen and appears to rise above ground, rapidly tapering, and producing one or two stems which had climbed about 6 feet in the largest specimen seen. Three of the roots dug up and carried about eight days have been found to grow freely when planted. A little further on *Premna coriacea*, Clarke, was met with; in this instance, it was a subscandent shrub. *Turra villosa*, Benn., and *Saccolobium maculosum* Hook. f., were found soon after; the latter unfortunately a solitary specimen. At the 25th mile from the coast the road passes over a high open place with sparse forest and outcrops of granite; this is the home of *Phœnix acaulis*, Buch.; this plant is only *comparatively* stemless, for many examples with stems 5 feet in height may be seen. As the fruit was ripe, several gardens are enriched from its produce, very few palms being more suitable for garden decoration, as it is elegance itself while young. At the 23rd mile from the coast, what appears to be the crest of the Ghauts is reached, and there is a short descent; on the highest point *Ficus Arnottiana*, Miq., was conspicuous, in fresh young foliage of a bright red colour. Its stipules are, in this instance, 2 inches in length, and fall off as soon as the leaves are developed. *Helicteres isora*, Linn., appeared as soon as the descent was commenced, and was soon followed by *Ipomœa vitifolia*, Sweet., which proved much less abundant here than it is 100 miles further north. Soon *Derris scandens*, Benth. became one of the chief ornaments of the road-side; its bright green leaves and rosy flowers were very beautiful in May. *Albizia stipulata*, Bois., is frequent here, and so is *Blumea myriocephala*, D. C., growing on steep banks, by the roadside. At 20 miles from Kumta, the course of the Bennihalla river was crossed; its greenstone bed was dry and washed clean, and on its banks, the Mango, *Pangamia glabra*, Vent., *Mimusops Elengi*, Linn., and several species of *Ficus*, with a graceful species of *Pandanus* not in flower or fruit. *Homonoia riparia*, Lour., a large grass, and immense plants of *Entada scandens*, Benth., occur in that locality, the latter without good specimens of its enormous legumes, the few collected being

not more than 2 feet in length. In that place *Capparis Heyneana*, Wall., displayed its large fugaceous flowers, in this instance white; but pale blue specimens were collected later. A little further on, Divimana was reached; here, *Chonemorpha macrophylla*, G. Don., was in bloom, its flowers  $4\frac{1}{2}$  inches in expanse, pure white when newly opened, but early becoming a pale yellow and of an agreeable odour, the foliage bright green and of strong texture; a desirable plant for a large garden; unfortunately no seed was procurable; an empty follicle, 9 inches in length, showed that the seed had recently escaped. *Naravelia zeylanica*, D. C., and *Ophiorrhiza Harrisonii*, Heyne, are found here in bloom in October, and here, growing on trees, is apparently a species of *Æschynanthus* with leaves much larger than any described in the Flora of British India, but it was not in flower. *Chasalia curviflora*, Thw., with its pretty pink and white wax-like flowers, occurs in the shade rarely; and *Pavetta Brunonis*, Wall., pokes its handsome corymbs of white flowers from every little thicket. Here was an *Asparagus* not in bloom, its cladodes  $\frac{1}{2}$  inch in breadth and of a very deep shining green which would be a real acquisition in gardens, as such foliage is rare. *Garcinia Cowa*, Roxb., is here a grand tree, with a straight stem, and so is *Holigarna longifolia*, Roxb. In a small stream a species of *Spirogyra* is found; and, on its banks, *Cardanthera pinnatifida*, Benth., *Blechnum orientale*, Linn., *Angiopteris evecta*, Hoffm., and *Alsophila glabra*, Hook. appear to be specially at home here, for the specimens seen were the largest that I have met with. From Divimana the road descends rapidly. On the slope a species of *Calamus* is widely distributed, and for a space of half a mile on the road, about 15 miles from Kumta, is a very graceful pinnate-leaved short-stemmed palm, answering as far as can be seen to the description of *Wallichia caryotoides*, Roxb.; but as that palm is not recorded in the Flora of British India as occurring here, this plant must be kept in view and its flowers and fruit obtained. *Hopea Wightiana*, Wall., abounds here and was carpeting the ground with its fallen flowers; it bears echinate galls which resemble the fruit of an *Artocarpus*. *Myristica attenuata*, Wall. and *Pithocolobium bigeminum*, Benth. are found in ripe fruit, and *Macaranga Roxburghii*, Wight, here attains the size of a medium tree. *Saraca indica*, Linn., apparently wild, is found only once; *Nephelium Longanum*, Camb., and *Cassia Fistula*, Linn., occur and *Garcinia indica*, Choisy, becomes common; *Wagatea spicata*, Dalz., and *Maba nigricans*, Dalz., being seen occasionally. At the bottom of the Ghaut, in the bed of a stream, beautiful clumps of *Osmunda regalis*, Linn., were found. The altitude here is very little above

the level of the sea, and the impression that the Royal Fern is only an Alpine plant in India, was dissipated. On banks at the side of the road here, *Naragamia alata*, W. and A., occurs, and in open places, the glorious *Lagerstræmia flos-reginæ*, Retz. is in full flower. *Artocarpus hirsuta*, Lamk., is common here; while this tree is young its leaves are very variable in form and size, the largest leaves measuring 17 by 8½ inches. On low banks in the tidal creeks, were observed *Calotropis gigantea*, Br., *Asclepias Curassavica*, Linn., *Vitex Negundo*, Linn., *Melastoma malabathricum*, L., and *Eugenia caryophyllæa*, Wight; while growing in the brackish water 18 inches in depth, is *Acrostichum aureum*, Linn. Now we have arrived at Kumta, where all the good soil is occupied with Cocoanut palms, but occasionally may be seen the Bread-fruit tree and *Suringee*.\* As the sea-shore is approached, *Ægiceras majus*, Gærtn., appears in the mud, and *Calophyllum inophyllum*, Linn., becomes more frequent; of the latter some very grand old specimens occur in the shelter of a small hill that protects the harbour. I have not seen noted the means by which cross fertilization is ensured in *Calophyllum inophyllum*. The sepals and petals of some of the flowers completely enclose the stamens, but leave a small aperture through which the stigma is protruded, so that it may receive pollen from another flower. As we embark, *Memecylon edule*, Roxb., and *Eugenia caryophyllæa* on the rocks and *Spinifex squarrosus*, Linn., in the sand, are the last plants observed.

COLLEGE OF SCIENCE,  
POONA;  
The 17th June 1894.

G. MARSHALL WOODROW.

#### *Synopsis of Practical Notes.*

*Hemidesmus indicus*, Br. (Kanarese *Dudeballi*) abundant between Yacombi and Divimana, North Kanara.

*Gymnema sylvestre*, Br., (not known by any name to people met with) abundant near the district bungalow, Sumpkund, North Kanara.

Cultivation of betel-nuts in North Kanara. Place selected for plantation—narrow valley—with sub-soil water available. No irrigation used, but a perfect system of open drains to remove superfluous water; trees 8 feet by 4 feet apart. Manure—young branches and leaves from forest.

*Modecca palmata*, Lam., (Kanarese *Iyer balli*) on the Kumta-Sirsi Road, 15 to 30 miles from Kumta.

\* *Ochrocarpus longifolius*, Benth.

# NOTES

## OF A

### BOTANICAL TOUR IN TRAVANCORE, ETC.

BY  
M. A. LAWSON, M.A.,  
GOVERNMENT BOTANIST, MADRAS.

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I left Ootacamund on the 14th November 1893, and returned on the 30th December; during this period I travelled over the following ground :—

Ootacamund.	Murchiston.
Shoranur.	Ayur.
Trichur.	Quilon.
Cochin.	Trivandrum.
Quilon.	Nagercoil.
Ayur.	Cape Comorin.
Colatoorpooiy.	Nagercoil.
Rockwood.	Tinnevely.
Poonamudi.	Ootacamund.

My object in travelling over this large extent of country was to find out the best stations in which to establish trained collectors, rather than to make extensive collections of plants myself.

At Quilon, I met Mr. Bourdillon, Conservator of Forests to the Travancor Government, and travelled with him for over a fortnight. From Mr. Bourdillon I obtained great assistance: he not only knows the country thoroughly well (he practically arranged my tour for me), but he has also a more extensive acquaintance with the trees of his district than any Forest officer I ever met with, with the exception of Sir Dietrich Brandis and Mr. Gamble. Mr. Bourdillon has promised to take people out with him, on tour, for the purpose of collecting plants; but he scouts the idea of establishing centres for native collectors; he says that he has tried this plan several times, and always without success. The men, he has sent, are afraid to go into the jungle by themselves; they stick in the bazaar in some village, and bring back only the commonest weeds. My experience of Tamil collectors is equally unsatisfactory.

I will describe briefly some of the places at which I staid :—

(a) *Ayur*.—A small native village, with a good traveller's bungalow, 28 miles distant from Quilon. The general elevation of the surrounding country may be taken at about 100 feet; there are some hills, but none of any great height. It was here that I first came across the *Zanonia indica*; a large huge climber with bunches of clavate fruits, weighing nearly a stone. It was here also that I first made acquaintance with the *Myristica magnifica*, Bedd. It is a tree which prefers swampy ground, and always in high forest; and extends from 1 to 600 feet. Colonel Beddome found it in the hills of Courtallum, so that its range of growth probably extends over some 80 miles of country, north and south. The tree is often fully 100 feet, or more in height. It has no distinct buttresses, so far as I observed; though this is stated by Beddome to be the case. The base of the tree in the more swampy places appears to rot, and the tree is then supported by vast stem-like roots, as is well known to be the case with many of the *Rhizophoræ*. The roots, which are all on the surface, sprawl along the ground, forming nodules, and even upright loops; rendering the walking under these trees anything but comfortable. In one case at Ayur, I crawled under the main stem of the tree. The wood, I believe, is of little value as timber. The other nutmegs here are the (2) *Myristica attenuata*, a tree from 60 to 80 feet in height, with a small oblong fruit. This grows with *M. magnifica*, but on the drier slopes. (3) *Myristica Canarica*, a tree about the same height as *M. attenuata*, and growing in the same sort of places. (4) *M. Beddomii*, King., grows at elevations of 2,000 feet and upwards.

(b) *Coolatoorpooly* is 16 miles from Ayur, and only slightly higher; but there are hills, in many places densely wooded, which rise to the height of 2,000 feet, on which grow many of the west country species of trees, such as *Dysoxylum malabaricum*, called in Cochin, the white Cedar; *Pterospermum rubiginosum*, a tree from 100 to 120 feet in height, and with a wood which is hard and red. *Pterospermum acerifolium* is also common. *Amoora Rohituka* with the flowers on long pedicels was also common; also *Aglaia minutiflora* Var., *Travancorica*. At Coolatoorpooly there is a good traveller's bungalow, and this would form a good place from which to make excursions into the surrounding districts.

(c) *Rockwood* is a tea plantation 7 miles from Coolatoorpooly,

and 2,000 feet in height. It is surrounded on all sides with magnificent high forest and would be an admirable centre from which to make excursions.

(d) *Poonamudi* and *Murchiston* are tea estates 25 and 28 miles, respectively, from Coolatoorpooly; *Poonamudi* is about 2,500 feet and *Murchiston* about 2,000 feet. From *Poonamudi* the hills rise to 4,000 or more feet in height, and in many places are covered with "black impenetrable forests," wholly unexplored by any botanist. Hill tents would be required to explore this part of the country, and some precaution would have to be taken to prevent wild elephants damaging the camp. Wild animals are said to be abundant, such as tigers, bison, and sambhur. From *Murchiston*, botanical tours might advantageously be made on the lower slopes of the hills, in the direction of Trivandrum.

(e) *Quilon* would form a good station for the collector. The backwaters contain a great variety of aquatic plants; and there is a coral reef on which many kinds of marine *algæ* are to be found.

(f) *Trivandrum* is not a centre of any importance from a botanical point of view.

(g) *Nagercoil* is a big straggling native town, 43 miles to the south of Trivandrum. It is 12 miles from Cape Comorin; and 12 miles from Thadikarama, which lies at the foot of the Ashambo hills, and where there is a good Forest bungalow. Six miles from Thadikarama, there is a tea plantation, where, I dare say, a collector could be put up; but to explore the mountains properly, tents would be needed.

Ayur, Coolatoorpooly, and Thadikarama have all of them a bad reputation for fever from the end of January to the end of May. The hill stations are said to be healthy all the year round. During December and January, there occur on these hills violent gusts of wind, which are generated on the cold plateau. These gusts last, as a rule, only for a very short time; but they are intensely cold and are said to be dangerous to persons who are not properly protected from them at nights. I stayed with several planters on the hills, from whom I received much kind hospitality and help; and they would, I am sure, cordially assist any one sent to explore the countries lying around their plantations.

# RECORDS

OF THE

## BOTANICAL SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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### VOLUME I.

No. 5.

### REPORT ON A BOTANICAL TOUR IN THE LAKHIMPUR DISTRICT, ASSAM,

BY

G. A. GAMMIE.



CALCUTTA:  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1895.



# REPORT

## ON

### A BOTANICAL TOUR IN THE LAKHIMPUR DISTRICT OF ASSAM.

1894.

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This tour was undertaken and accomplished during the months of March and April 1894.

Although at this season of the year the bulk of the herbaceous vegetation is either dormant or has not yet appeared, still from the similarity of the Flora to that of the Sub-Himalayan tracts to the westward, I was able to identify many plants from long and intimate acquaintance with their general appearance.

A representative collection of specimens was made, chiefly from trees and shrubs in flower or fruit, which has afforded me a good insight into the composition of the woody vegetation, and while engaged in determining my plants in the Calcutta Herbarium, I often found it possible to correlate materials obtained by former collectors. Of these the first were Dr. Wallich and Dr. Griffith who were deputed by Government, in 1834, to examine the tract of country producing the indigenous tea plant. The latter botanist has left on record (in the Transactions of the Agricultural and Horticultural Society of India, Volume V, 1838) a valuable systematic list of plants collected in the neighbourhood of Sadiya in which he emphasizes the strong affinities of this Flora with that of China. Of more recent collections the chief have been those formed by Mr. Gustav Mann, late Conservator of Forests in Assam, and Mr. C. B. Clarke. Both have devoted much of their leisure time and attention to the Flora of this province greatly to the advantage of Botanical Science. Thanks to the labours of these and other botanists and collectors, little of novelty can now remain undiscovered in the valley, but the surrounding mountains must yield rich harvests to naturalists in the future.

Joining the daily despatch steamer at Jatrapur I went direct to Dibrugarh, the chief town in Lakhimpur. This rapid voyage up the

Brahmaputra (occupying only five days) affords few facilities for the observance of the details of the Flora, but it allows one to note the chief features of the country and its vegetation. In my case, unfortunately, the view was circumscribed by the obscurity caused by the haze over the country.

Up to within a short distance of Gauhati the banks of the river are low, and the depressed expanses of sand on either side are absolutely bare or are covered with extensive savannahs of tall grasses. The scenery is, therefore, extremely monotonous. Forests are confined to the mountain ranges seen in the distance and to the small peculiarly isolated hills which are scattered throughout Assam. The country is well-wooded around Gauhati which lies at the base of the northern slopes of the Khasia Hills. Low ranges of hills clothed with trees are seen on the opposite side of the river. Again the country is botanically poor until we arrive at Tezpur where the valley narrows considerably. The undulating hills here bear scrubby vegetation. Further on there are successions of grassy wastes, cultivated land and forests now more imposing in appearance and enlivened by the white flowers of *Æsculus punduana* which is very common. Towards Dibrugarh the forests are of still greater extent and at Sadiya and in the great forest of Makúm they seem boundless as they sweep through the plain up to the rugged heights of the encircling Himalayas of whose Natural History in this most interesting region we possess but fragmentary knowledge. The increase of elevation between Goalpara (150 feet) and Sadiya (440 feet) is only 290 feet, a remarkable fact when we take the distance between these places into consideration.

To supplement this meagre account of the Assam Valley, and especially of its lower area, I take the liberty of transcribing the excellent remarks concerning the sequence of the vegetation furnished by Dr. (now Sir Dietrich) Brandis in his "Suggestions regarding Forest Administration in Assam." He classified the forests and waste lands of Assam as follows :—

"*First*.—Grass lands often with scattered trees (semul, *e.g.*).

*Second*.—Sâl Forest.

*Third*.—Forests of *sissu* and *khair* with other deciduous trees.

*Fourth*.—Mixed forests. Semul (*Bombax malabaricum*), *Sterculia villosa*, *Albizzia procera*, *Spondias mangifera*, *Anthocephalus Cadamba*, *Semecarpus Anacardium*, *Careya arborea*, *Dillenia pentagyna*, *Lagerstrœmia parviflora*, *etc.*

*Fifth*.—Evergreen forests which vary exceedingly in different parts of the valley. Species of *Amoora*, *Michelia*, *Magnolia*, *Quer-*

*cus* and *Castanopsis* are invariably found on them and on low grounds *Dillenia indica* is, throughout the valley, one of the constituent trees. On high ground *Artocarpus Chaplasha* occurs all over the valley, while "Nahor" (*Mesua ferrea*) is common in the evergreen forest of the upper portion. *Stereospermum chelonoides* is a characteristic tree of the evergreen forests of Upper Assam. The "Soom" (*Machilus bombycina*) forests of Upper Assam form a remarkable subdivision of this class of evergreen forest. The remaining types are bamboo forests and cane brakes.

*Lagerstræmia Regiæ*, *Artocarpus Chaplasha*, *Dillenia indica*, and *Bombax malabaricum* are found throughout the Assam Valley. *Mesua ferrea* is only found in the upper part although it is common in the evergreen forests of the Garo and Khasia Hills. *Sâl*, *sissu* and *khair* are only found in the lower part of the valley. *Dillenia pentagyna* and *Lagerstræmia indica* extend upwards as far as *sâl* with which they are associated."

Immediately on arrival at Dibrugarh I made arrangements for visiting the Makûm forest and, next morning, departed by train to Margherita, a beautiful place lying at the foot of the Naga Hills and a deservedly favourite holiday resort of the Europeans resident in the district. The railway is owned by the Assam Coal and Trading Company and runs about eight miles beyond Margherita to the mines. For many miles the train speeds through cultivated fields and tea plantations most prosperous in appearance and in reality. The continuous extension of the latter and the influx of industrious immigrants from various congested districts in India will, in course of time, tend to transform this mainly forest clad division of Assam into a wealthy and well populated tract.

It appears that the Assamese, addicted to the use of opium, from false pride of race refuse to render labour for hire and thus leave the field open to strangers. Great areas in Upper Assam certainly bear traces of the existence of a former large and industrious population, and the present indolence of the people may be the outcome of years of oppression by surrounding tribes whose constantly recurring barbarous raids would render life and property so insecure that they would naturally exert themselves only for their immediate personal requirements. However it may be, there is no reasonable doubt regarding the fact that Upper Assam was once in a most flourishing condition and that great areas afterwards relapsed from cultivation because the invading hill tribes and the Burmese devastated the land and carried off the bulk of the population to slavery leaving the remainder in a state of hopeless despair and lethargy from which they may never free themselves.

The outskirts of the great forest of Makúm are reached at the railway junction of that name. Onwards is Digboi where petroleum wells have been tapped. Here the land becomes rugged for a short distance and the railroad is carried through the forest which is dense and penetrable with difficulty on account of the overwhelming mass of vegetation. Bamboos of several species are common. The most noteworthy are a large species growing in gigantic clumps (*Dendrocalamus*) and another (*Pseudostachyum polymorphum*) with multitudes of scattered culms. The latter was in flower and specimens were collected. It is advisable never to omit gathering specimens of any bamboo when in flower or fruit as years may elapse before such an opportunity may occur again.

The more characteristic features of the vegetation in the Makúm forest may be summed up shortly as, in my opinion, it is preferable to exhibit the subject according to a systematic method at the end of this paper.

The coal mines are at some elevation on the face of the hills eight miles eastward of Margherita. From there a comprehensive view can be obtained of the boundless forests extending to the horizon with the river Dihing winding through their midst. To the west are seen the grassy slopes of the settlement with smaller clearances scattered through the forest in its vicinity.

Large trees form a predominant feature in these forests whose aspect is relieved from uniformity by their extremely diverse forms. No single species is gregarious and the component individuals represent widely different orders and genera.

Many tower over the observer who is impressed by the imposing grandeur afforded them by their height and bulk. Chief among these are a tall clear stemmed species of *Dipterocarpus* (*D. pilosus*); *Mesua ferrea*, the famous "Nahor" or Iron Wood, *Dunbanga sonneratioides*, a stately tree with tabular, weeping branches terminated by panicles of large white flowers; *Bischofia jaranica*, of wide distribution and justly valued for the quality of its timber; *Talauma Hodgsoni*, always a tree of note with dense foliage of large dark-green lucid leaves and glaucous flower buds opening into white flowers which shed their numerous petals immediately they unfold.

Of trees prominent from other peculiarities we have *Mallotus albus*, *Mallotus denticulatus*, *Pterospermum acerifolium*, *Castanopsis indica*, *Actinodaphne obovatum* and *Myristica longifolia* all distinguished by the light colour on the undersurfaces of their leaves; *Bombax* and *Erythrina* armed at all points with hard conical prickles; *Aralia Thomsonii*, with slender, prickly stem crowned by a head of

large, radiating decomposed leaves giving it somewhat of the appearance of a Tree Fern ; *Ficus Roxburghii*, with large leaves and clusters of enormous figs in great masses towards the base of the stem and in smaller groups along the strong, diverging branches ; *Ficus Cunia*, bearing quantities of round figs, the size of marbles, along the pendulous branches thrown out by the tree to bear its fruits. Another again is *Gynocardia odorata* which bears flowers over the surface of its stem and branches. The flowers are succeeded by hard globular fruits which render the tree a conspicuous object in the forest.

Other remarkable trees are *Alstonia scholaris*, with branches and also leaves in whorls ; *Oroxylum indicum*, with huge strap-shaped fruits ; *Dillenia indica*, *Meliosma simplicifolia* and *Saurauja Roxburghii* with large, strongly veined leaves ; *Salix tetrasperma*, the only tropical Indian representative of its genus ; the laurels *Litsæa citrata*, with leaves and fruits strongly citron scented, *Litsæa salicifolia* and *Litsæa polyantha*, one of the commonest trees in the Makúm forest.

Not less remarkable than the diversity of forest trees is the wealth of epiphytal vegetation which everywhere arrests attention. *Pothos* and *Rhaphidophora* of several species cling closely to the trunks of trees and cover them to their very tops with their creeping stems and peculiar foliage.

The common climbing fern *Acrostichum scandens* also grows in the same manner, its graceful drooping pinnæ depending in close order along the whole length of tall trees. *Asplenium Nidus* and *Polypodium punctatum* are common on branches, the former growing with its long broad fronds in a cup-shaped manner which has suggested its trivial English name of "Birds' Nest Fern," the latter with somewhat similarly shaped fronds springing thickly and irregularly from dense masses of root fibres. *Davalliæ* and *Asplenias* of various species with delicately cut fronds occur in profusion. As a rule, in the dry season, these are altogether deciduous, the rhizomes remaining dormant until the succeeding rains or they curl up becoming dry and wilted although not dead and only unfold to resume their freshness when their roots are drenched with rain or saturated with aqueous vapour. To state the case succinctly, most epiphytic rhizomatous ferns with articulate stipes are deciduous in the dry season, while tufted species, forming a decided minority, are not so.

Two remarkable ferns *Drymoglossum carnosum* and *Polypodium nummularifolium* with widely creeping rhizomes and small tongue-like, succulent fronds, crawl over the branches of shrubs. Other striking examples of epiphytal ferns are *Lindsaya repens* and *Neph-*

*rolepis exaltata* both with scandent stems; *Antrophyum reticulatum* with its sori arranged along the lines of venation and *Vittaria elongata* with dense masses of drooping grass like fronds. Of orchids, the most typical and extensive order of Epiphytes in tropical regions, there are fewer representatives than one would expect to find. *Dendrobium*, *Saccolabium*, *Ærides*, *Sarcanthus* and *Bulbophyllum* are most in evidence.

The shrubby vegetation forming the undergrowth is dense, more especially so in places where the light is not excluded by the canopy of trees. In open parts where the forests have been more or less cleared away the commonest shrubs are *Mæsa indica*, which so often monopolizes abandoned cultivated lands to the detriment of more useful vegetation in the Eastern Himalayas; *Croton caudatus* (often becoming a tree); *Clerodendron infortunatum* whose white flowers in large open panicles exhale an overpowering fragrance; *Solanum indicum* and *Combretum chinense*. On the river banks free of the larger competing vegetation are *Homonoia riparia* which grows gregariously on river shoals sometimes covered by floods for months; *Ficus heterophylla*, *Ficus pyriformis*, *Ficus hispida*, *Acacia Intsia* and many more. On the borders of cleared tracts and even within them the small scrubby bushes are often completely enveloped by the subscandent fern, *Gleichenia dichotoma* and the climbing species, *Lygodium microphyllum*, while over all trails a wide spreading *Selaginella*.

Their presence has been fostered by recent clearances of virgin forest and I have never yet met with these plants except in similar localities. *Davallia tenuifolia* and *Pteris semipinnata* have also effected a permanent footing on the steep sides of road cuttings and ditches in the vicinity, and as these five species of plants (and, of course, many others) do not exist in the natural forests around, one is puzzled to account for their apparently spontaneous appearance.

The botanical traveller in the Himalaya (to speak from my experience alone)-could without difficulty produce scores of instances proving the multiplication of many otherwise rare forms of plant life induced through the development of a country by means of cultivation and roads. Similar conditions also materially hasten the extinction of indigenous vegetation.

In the confines of the forest the shrubby vegetation is for the greater part composed of species different from those noted in the more open tracts.

For convenience of discussion it can be readily divided into erect and climbing shrubs. As examples of the former we may take *Gar-*

*denia campanulata*, one of the commonest in the forest, a spinose virgate shrub redeemed from absolute ugliness by the beauty of its fragrant white flowers, *Phyllanthus reticulatus*, *Glochidion hirsutum*; *Villebrunea integrifolia*, *Boehmeria platyphylla*, *Sarcochlamys pulcherrima*, three Urticaceous plants all yielding strong, serviceable fibres; *Leea sambucina*, an undershrub often gregarious; *Styrax serrulatum*, sometimes attaining the stature of a tree, most beautiful when in flower with pure white corollas and bright yellow anthers; *Buddleia asiatica*, also a most striking plant when its branches droop with the burden of the closely set panicles of perfumed white flowers; *Viburnum Colebrookinum*, another plant also conspicuous when in bloom; *Acanthus leucostachys*, a low shrub with holly like leaves more remarkable for its rarity than for beauty; *Sapindus attenuatus*, a loosely growing small shrub with flowers of a peculiarly dingy brown colour; *Morus indica*, the Indian Mulberry, moderately common as a spreading shrub and its black fruit clusters are palatable in a country where there is so little variety in edible fruits; *Callicarpa macrophylla*, with hoary leaves; *Dædalacanthus nervosus*, a handsome plant with veined bracts and bright deep blue flowers; three interesting species of Rubiaceæ, *Wendlandia tinctoria*, *Saprosma ternatum* (with many of its leaves arranged in whorls of three), and *Psychotria denticulata*.

These only are cited as types of the erect shrubby vegetation but many others could readily be named as one reviews the Flora within reach of the winding and intersecting paths of the forest.

We now transfer our attention to the scandent shrubs which are a decidedly predominant feature of the locality.

*Fasminum undulatum* is a common dense climber. *Mussaenda glabra* attaining to considerable heights, betrays itself by its milk white foliaceous calyx lobes. *Uncaria sessilifructus* and *Uncaria macrophylla* are large climbers with hard, curving, stipular thorns resembling buffalo-horns in miniature.

*Tournefortia viridiflora*, of lurid green aspect, represents the order Boraginaceæ.

*Heptapleurum venulosum*, one of the few Araliaceous plants existing here, is an enormous climber with numerous branches each terminated by copious panicles of red-brown fruits. *Rubus lucens*, belonging to a genus characteristic of Temperate Regions, forms tangled and impenetrable thickets in association with the equally well armed *Zizyphus funiculosa*, *Z. rugosa* and *Zanthoxylum Hamiltonianum*. *Aspidopterys Roxburghiana* is a soft leaved climber bearing masses of light brown winged fruits. *Aristolochia saccata* has also large soft leaves.

To continue the list we have *Poderia tomentosa* whose flowers resemble those of *Cinchona*; *Naravelia zeylanica*, a widely climbing plant with long plumose achenes; *Melodorum bicolor*, an abundant Anonaceous plant whose brown tomentose buds open out into dark red flowers; *Tapiria hirsuta*, a climbing member of *Anacardiaceæ*, and *Conocephalus suaveolens*, a gigantic large-leaved climber both common throughout the tropical forests of the Eastern Himalaya. Several very prickly species of *Acacia* also prevail as climbers.

Other plants to name for the further illustration of climbing vegetation would be *Thunbergia grandiflora*, *Thunbergia coccinea*, *Thalldiantha*, *Hodgsonia heteroclita*, *Trichosanthes*, *Gynostemma*, *Vitis*, *Ipomæa* and other genera of *Convolvulaceæ*, *Trachelospermum*, *Ecdysanthera*, *Illigera*, *Combretum*, *Ficus scandens*, *Pagræa obovata*, etc.

The order of Palms also finds a place in this Flora. *Calami* of several species are gregarious and add to the difficulty of exploration in this forest by the bristly array of strong, sharp spines with which all are invested. *Phœnix sylvestris*, the Toddy Palm, and *Areca Catechu*, the Betel Nut, are not indigenous but are cultivated by the villagers. Some noble species seem to be truly wild, such as *Caryota urens* one of the most graceful palms in India; *Wallichia disticha*, most worthy of note from producing its fronds in two regular series on opposite sides of the stem as in *Ravenala*; *Wallichia densiflora*, a short stemmed species with *Caryota*-like leaves; *Livistona Jenkinsiana*, with a crown of large fan-shaped fronds; and *Pinanga gracilis*.

Plantains (*Musa*) of several varieties are cultivated by the natives and a small slender stemmed species with an erect inflorescence—*Musa rosacea*—grows here and there throughout the forest.

Tree ferns are also comparatively numerous—*Alsophila glauca* and *A. glabra*; but here neither make any approach towards their maximum development, indeed I did not observe the former with caudices more than 10 feet high and then the stems were thin and bare but a scanty crown of fronds.

*Angiopteris evecta* is of normal growth and this is the western limit (so far as our knowledge at present stands) of *Dicksonia Barometz*, formerly distinguished as *D. assamica*. This has large glaucous tree-fern-like fronds rising from a depressed caudex covered with bright, chestnut-coloured scales.

The last observations to be noted before we finally leave this forest are those concerning the herbaceous vegetation which, as may be presumed, is poor in comparison with the abundance of arboreal and shrubby types.

Ferns flourish under a variety of forms. *Davallia Speluncæ*, *D. Hookeriana*, *D. tenuifolia*, *Pteris quadriaurita*, *P. biaurita*, *P. semi-pinnata*, *P. cretica*, *P. aquilina*, *Asplenium esculentum*, *Asplenium platyphyllum*, *Nephrodium decurrens*, *N. membranifolium*, *Polypodium nigrescens*, *Gymnogramme Hamiltoniana*, *Acrostichum variabile*, *A. axillare*, *Blechnum orientale* are a few of the many that could be enumerated.

In marshy situations *Phrynium* and *Alpinia* grow in dense masses supplying a never failing stock of fodder for wild and domesticated elephants. In shallow lakes we find a distinctive type of vegetation such as *Enhydra fluctuans*, *Grangea*, *Hypericum japonicum*, *Equisetum debile*, *Polygonum*, the rare little *Pilea peploides*, *Mimulus*, *Torenia*, *Sagittaria*, *Ottelia alismoides*, *Potamogeton*, the bristly Aroid *Lasia heterophylla*, *Coix lachryma*, *Arundo*, *Saccharum cylindricum*, *S. spontaneum*, *Anthistiria gigantea*, *Cyperus* of many species, *Equisetum debile*, etc., and floating on the surface, *Lemna* and other stagnant water plants.

The ordinary herbaceous vegetation is too varied to allow of even a moderately exhaustive list to be given here. The majority consist of weeds of cultivation common to all the warmer parts of India. The following selection may serve to illustrate the subject. *Ranunculus sceleratus* is common in marshes. *Nasturtium indicum*; *Ænanthe bengalensis*; *Seseli daucifolium*; *Stellaria media*, covering the banks of ponds; *Fragaria indica*; *Hydrocotyle rotundifolia*; *Ammannia rotundifolia*; *Blumea* of several species; *Xanthium strumarium*, in great quantity in waste places; *Vernonia cinerea*; *Saussurea affinis*; *Crepis japonica*; *Gnaphalium luteoalbum*; *Gnaphalium indicum*; *Siegesbeckia orientalis*; *Spilanthes Acmele*; *Lobelia affinis*; *Verbena officinalis*, *Mazus*, *Vandellia*; *Torenia*, *Oldenlandia*, several species of *Hedyotis* and *Ophiorrhiza*. *Cynodon dactylon* forms good turf on cleared plots. On river banks are coarse grasses, sedges, *Rumex maritimus*, *Elatostema rupestre*, and several species of *Polygonum*. Labiates are common, such as, *Stachys oblongifolia*, *Leucas linifolia*, *Elsholtzia blanda*, *Mosla dianthera*, *Leonurus sibirica*, *Perilla ocimoides*, etc.

Having obtained a fairly complete collection of plants in flower and fruit in the forest of Makúm I returned to Dibrugarh where I remained two days to make arrangements for an excursion to Sadiya, about 60 miles further up the Brahmaputra. The town of Dibrugarh is well laid out and drained and the roads are bordered by avenues of shady trees. *Tectona grandis*, *Tamarindus indica*

and *Picus religiosa* all form good trees. *Melia Azederach* is also commonly planted and I saw a few bushes of *Punica granatum* in full flower. The gardens in the compounds of the European residents are tastefully arranged and most of them contain plants of showy Indian orchids which thrive on the trees.

At this season of the year the river is at a very low ebb leaving beaches of glittering white sand on both banks

In travelling to Sadiya the railway again proves a convenience as it runs to a tea plantation named Talap. The journey is completed by a walk of 10 miles and a voyage of 6

From Talap a good road runs to Saikwa at present a village and market place where few supplies can be obtained, but formerly it was also a military outpost.

The greater part of this route is through rice-cultivated land broken in many parts by forests, generally of secondary growth, which become continuous as the Brahmaputra is approached. The rice fields which had become marshy since the heavy rainfall of the previous week were full of *Sagittaria*, *Ammannia*, *Polygonum sagittatum*, *P. strigosum*, and other common species of *Polygonum*, *Jussiaea suffruticosa* and a profusion of Cyperaceous plants. The arboreal and shrubby vegetation was mainly identical with that of Makúm. *Æsculus punduana* is exceedingly abundant and the undergrowth is tangled and dense. *Cuscuta reflexa* covered the latter, in many places, with its festoons of slender interlacing stems and white flowers.

From Saikwa Ghât the last 6 miles to Sadiya on the opposite bank are covered by a voyage in dug out canoes which are poled rapidly enough up stream by two men in each. The ordinary country boat built up of separate planks does not seem to be in use in this part of the river which is wide but rather shallow, and its sandy banks are skirted by forests of great extent.

The military outpost of Sadiya, situated close to the right bank, of the river, is surrounded by far reaching stretches of grass savannahs interspersed by coppices of small trees. A large annual bazar was formerly held here to the mutual advantage of traders from the wild tribes in the mountains and merchants from the low countries, but I believe they were discontinued a year or two ago on account of the virulent epidemics which broke out among these large gatherings of people.

In favourable situations in Sadiya, the trees are of noble growth compared with those that form the coppices.

In addition to the grass lands at this isolated settlement a

remarkable feature is the sterile aspect of some very large tracts covered by a close scrub composed of *Solanum torvum* and *Flemingia congesta* but principally the former.

Regarding this plant Captain W. H. Lowther sounded a note of alarm in the Journal of the Agri.-Horticultural Society of India, Volume XI (1861), page 290. The article is entitled "On the mischievous increase of a gigantic species of *Solanum* on the North-East Frontier of Bengal, more especially in the Tea Districts of Assam."

He states that the plant was identified as *Solanum torvum*, Swartz, and that it promised to be one of the most stubborn and formidable antagonists with which Indian agriculture would ever have to contend.

So far as he could ascertain the plant was of spontaneous origin and only forced itself on human notice some ten or twelve years before in Upper Assam where its rapid growth and productiveness had earned for it an evil repute. The fruits are too nauseous to be palatable to human beings, but they are devoured by many animals and birds and the seeds always pass undigested.

The military outpost at Saikwa on the Brahmaputra was deserted chiefly because it was overwhelmed by this plant, which no outlay could diminish or keep in check, and now, at Sadiya, on the opposite bank, the same state of affairs seemed imminent. The heaviest growth is observed on recently deserted fields.

Fortunately we can say, after the lapse of 33 years, that the writer's fears have not been realized and, although *Solanum torvum* is still a pest in the deserted homesteads of Upper Assam, it readily succumbs to the influence of careful and continuous cultivation. Where it flourishes (and that is never in the forests), it stands bearing eloquent testimony to the pernicious results caused by "joom" cultivation, a custom still followed by the mountain and sub-montane tribes, but this system is now greatly checked and will soon be traditional in the settled districts. Many areas of valuable land abandoned by indolent cultivators are overrun by this *Solanum* with other equally harmful shrubs and by many species of strong coarse grasses long before a more valuable type of vegetation is strong enough to compete with them on equal terms. *Artemisia vulgaris*, *Plectranthus ternifolius* and *Lepedeza sericea* are very common as are also three remarkable climbers not observed at Makúm, namely, *Acanthopanax aculeatum*, *Myxopyrum smilacifolium* and *Miquelia Kleinii*. Of trees the most interesting are *Ficus pomifera* with clear, grey, cylindrical trunk bearing figs in clusters; *Echino-*

*carpus sterculiaceus*, with large fruits armed with long, closely packed, stiff spines which made progression through some patches of jungle a matter of difficulty and pain to the native collectors; *Prunus Jenkinsii*; *Cordia Myxa*, abundant; *Stereospermum chelonoides*; *Castanopsis indica* and *citribuloides*; *Mangifera indica*, *Artocarpus integrifolia* and *Eugenia Jambos* are common in groves (apparently of considerable age) which mark the sites of once prosperous villages. The mango seldom comes to perfection in Upper Assam as the young fruit is generally destroyed by grubs.

Of the smaller trees prevalent in the scattered copses already mentioned there are *Phyllanthus Emblica*, *Glycosmis pentaphylla*, *Lepionurus oblongifolius*, *Baccaurea sapida*, *Gardenia companulata*, *Ficus silhetensis*, *Micromelum pubescens*, *Randia fasciculata*, *Pavetta indica*, *Linociera macrophylla*, *Symplocos spicata* and a few others.

At this season of the year, and probably all the year round from indications observed, there is but scanty herbaceous vegetation in these groves.

Some shrubs are common here which seem to be absent from Makúm, such as *Coffea bengalensis*, *Justicia Gendarussa*, *Desmodium laxiflorum*, *Lippia geminata*, *Pogostemon parviflorus*, *Adhatoda Vasica* (which has recently attracted attention by its virtues as an insecticide), *Dracæna angustifolia*, *Dracæna petiolata*, *Cannabis indica* and *Physalis minima* are common as escapes on cultivated land.

*Rubus rosæfolius* with double flowers and *Rubus lasiocarpus* are both common. Of herbaceous plants we find some interesting examples. *Veronica javanica* grows on banks; *Viola Patrinii* abounds in grassy fields; *Potentilla Kleiniana* and *Cynoglossum glochidiatum* thrive on the sandy banks of the river. These three species are manifestly immigrants from the adjacent mountains.

*Commelina nudiflora*, *Aneilema nudiflorum*, *Celosia argentea*, *Oldenlandia*, *Blumea*, *Rungia*, *Chenopodium album*, *Bryophyllum calycinum* are a few more instances of the herbaceous vegetation which in all respects resembles that of other parts of the district.

We know but little of the Botany of the surrounding mountains. The Abor tribe only cultivates the land lying on the plain at the foot of their territory. Their principal crops are Indian corn, irrigated and dry ground rice, *Eleusine* and various other millets, Job's tears (*Coix*) beans of various kinds, pumpkins, gourds, etc.

I was informed by Mr. Needham, the Political Officer at Sadiya, who possesses a unique knowledge of the languages, manners and

customs of his turbulent neighbours, that the Mishmi tribe still brings down Rubber but in greatly diminished quantities compared with what was brought in former years, so their trees are probably becoming exhausted. He also told me that the Abors do not collect any Rubber whatever as they are deterred from doing so by the belief that the vindictive spirits which haunt all trees (and consequently all trees are spared from destruction) would immediately resent any damage done to their habitations. The Abors will not even allow sceptics to brave the terrors of ghostly indignation, but the Chalikatás, a tribe to the westward of them, although sharing in the same superstition, do not refuse to strangers the privilege of tapping the Indian Rubber trees (*Ficus elastica*), pecuniary considerations doubtless outweighing their scruples and fears. These Chalikatá (or crop-haired) Mishmis are said to be the first people on the Indian side of the Himalayas to discover the valuable properties of the Rheeá fibre; it is also said that from some species of nettle they manufacture cloth so strong that it is impervious to arrows when worn as loose jackets.

As regards the whole district of Lakhimpur, with its sparse population, Robinson in his "Descriptive Account of Assam" in 1840, says that it presents a miserable picture of depopulated villages and orchards and plantations run to waste or covered with dense jungle.

This statement still holds good for a great part of the district. Sir W. W. Hunter has given a graphic sketch of its physical aspects in the Statistical Account of Assam.

To sum up, Lakhimpur presents most diversified scenery. It is situated at the extreme north-east end of the Assam Valley so that it is narrowly confined on three sides by the Himalayas and their offshoot, the Naga Hills. In populated parts there is much rice land and many tea plantations. The forests are large and contain good timber. Throughout the area, and especially near river banks, gigantic grasses cumber ground which is either perennial marsh or flooded only during the rains.

Houses are built with frameworks of wooden posts arranged to suit the disposition of the rooms. Natives cannot be particular regarding the kind of wood used for this purpose, but stems of "Nahor" (*Mesua ferrea*) are preferred by the European residents. To form the walls, the spaces between the posts are often filled with single vertical lines of stripped *Arundo* stems and a coating of plaster and white-wash on both sides gives them an air of solidity. The high pitched roofs are thatched with the long leaves of the tall grasses abounding everywhere.

The climate, as can be deduced from the selection of plants I have

given, is subtropical, the average annual temperature being about 65° Fahrenheit. The rainfall is heavy (about 115 inches annually) and the wet season is of long duration, lasting from April to October. North-easterly winds are said to prevail throughout the greater part of the year.

The chief crop cultivated by the Natives is rice. The minor crops are identical with those grown in Bengal, such as Indian corn, millets, pulses, mustard, pumpkins, gourds, brinjals, potatoes and many others. Tomatoes seem to thrive most admirably.

Near a few villages I saw plots of castor oil plants (*Ricinus communis*) on which are reared the "eri" Silkworms. I was informed that since cloth could be obtained so cheaply in the bazaars the people had almost abandoned the practice of sericulture, and evidence is not wanting to show that in a few years the art will be lost to this people.

In the following pages I append a list of plants found in the Lakhimpur District, arranged according to the systematic method for convenience. This list is based mainly on my own observations and thus is far from being complete, but I am able to include in it many species not brought into the preceding account and it may serve the purpose of exhibiting, in a small degree, the affinities of the Flora.

#### LIST OF THE PRINCIPAL PLANTS FORMING THE VEGETATION OF LAKHIMPUR

##### *Ranunculaceæ*

*Naravelia zeylanica*, DC.]common; *Ranunculus sceleratus*, L. and *Ranunculus pensylvanicus*, L., both tall herbs abounding in swamps and on river banks.

*Coptis Teeta*, Wall.—This plant is indigenous in the Mishmi mountains and is included in this list because its roots are brought by the hill people to Sadiya from where it is exported to Bengal and other parts of India where it is held in much esteem as a drug possessing tonic and febrifugal properties. The yellow colouring matter in the roots is quickly soluble in water, but the quantity imported must be far too limited to allow of any part to be used as a dye, besides the expensive nature of the product would debar its utilization for such a purpose. So far as I can ascertain the plant has never been subjected to experimental culture.

*Aconitum Napellus*, L.—The roots of this and perhaps of other species are used by the hill tribes to make their deadly arrow poison. The plant is said to grow only on the interior highlands inhabited by the Tibetans who take the precaution of dipping the roots in boiling

water to destroy their vitality before exporting them to the lower hills. The approved method of preparing the roots by the Abors (and, doubtless, by the other tribes) is to pound them into a rough powder which is mixed with pigs fat (or, it is said, sometimes with the mucilage from the fruits of *Dillenia indica*) to ensure perfect and continuous adhesion. The mixture is applied firmly to the arrow head leaving the point bare. The shaft is often incised just behind the head, so that it easily breaks off when an animal is struck.

#### *Dilleniaceæ.*

*Delima sarmentosa*, L.—A common large climber in the forests.

*Dillenia indica*, L.—One of the commonest trees in the district and throughout the province.

#### *Magnoliaceæ.*

In Dr. King's valuable monograph of this order, eight species of forest trees yielding good timber are recorded from this district. They are *Talauma Hodgsoni*, Hk. f. and T., *Magnolia pterocarpa*, Roxb., *M. Gustavi*, King, *M. Griffithii*, Hk. f. and T., *M. Pealiana*, King, *Manglietia insignis*, Bl., *M. Caveana*, Hk. f. and T., *Michelia Mannii*, King. There is one climbing species, *Kadsura Roxburghiana*, Arn.

#### *Anonaceæ.*

Of this order there are three climbers, *Uvaria Hamiltonii*, Hk. f. and T., *Melodorum bicolor*, Hk. f., *Miliusa Roxburghiana*, Hk. f. and T.; two shrubs, *Unona discolor*, Vahl., and *Goniothalamus sesquipetalis*, Hk. f. and T. and one small tree, *Polyalthia simiarum*, Bth. and Hk. f.

#### *Menispermaceæ.*

The plants I noted of this order were *Tinospora* sp., *Anamirta Cocculus*, W. and A., *Pericampylus incanus*, Miers, and *Cissampelos Pareira*, L., which is very common on the outskirts of small woods at Sadiya.

#### *Papaveraceæ.*

*Argemone mexicana*, L.

*Papaver somniferum*, L.—The cultivation of opium is forbidden in Assam, but as it is grown by the hill tribes the inhabitants of the valley can probably smuggle as much as they require. In the "Englishman" newspaper of the 14th April 1894 an interesting extract was published of an account of the Singpho tribe. The

original article was communicated to the Royal Geographical Society by Mr. Errol Gay, a Tea Planter, who attempted, unsuccessfully, to journey from Assam to Western China. The following are his statements relating to opium culture. "Every Khamti village has a large extent of poppy cultivation, generally in its immediate vicinity, and there are very few Khumits abstainers from the drug. About the middle of February, the capsules, of which there are three or four to a plant, begin to ripen; a small incision is now made with a sharp knife in each and the sap oozing out is wiped off on a piece of clean cloth. The following day the plant is given a rest and on the third day another incision is made and the sap wiped off as before. The process is repeated every other day until the capsule is exhausted. The cloth is carefully set aside in long strips about 3 inches wide until required when a small piece is cut off and steeped in tepid water which extracts all the drug and has an intoxicating effect."

From this it would appear that the opium is never smoked.

#### *Cruciferæ.*

*Nasturtium palustre*, DC., and *N. indicum*, DC., are common weeds in moist places. *Brassica juncea*, Hk. f. and T., is cultivated for the sake of the oil expressed from the seeds, universally used in native cookery. The leaves are eaten as pot-herbs. *Raphanus sativa*, L., the radish, is grown in small enclosed plots by the villages.

#### *Capparidæ.*

*Cleome viscosa*, L. *Capparis olacifolia*, Hk. f. and T., and *C. viminea*, Hk. f. and T., are subscandent shrubs.

#### *Violacæ.*

*Viola Patrinii*, DC., grows in the grass at Sadiya, our first instance of a mountain plant extending to the plains of this district.

#### *Bixineæ.*

*Gynocardia odorata*, R. Br.—Common tree in the Makúm forest. The oil of the seeds is used for curing skin diseases. The ripe fruit, when breaking up, exhales a powerfully fragrant odour.

#### *Caryophyllæ.*

Three common weeds, *Stellaria media*, L., *Polycarpon Læflingæ*, Bth. and Hk. f., and *Drymaria corata*, Willd. The adhesive capsules of the last named adhere firmly in large numbers to cloth and render the plant a well-known pest.

*Portulacæ.*

*Portulaca oleracea*, L., common on the sands of river banks.

*Hypericinæ.*

*Hypericum japonicum*, Thumb, a common mountain weed, rare in the plains.

*Guttiferæ.*

Various species of *Garcinia* and *Mesua ferrea*, L., one of the characteristic large trees of Upper Assam yielding a most valuable wood difficult to work on account of its hardness.

*Ternstræmiacæ.*

*Saurauja Roxburghii*, Wall., a common small tree; *Schima Wallichii*, Choisy, yields good timber, which is, however, liable to warp; *Camellia theifera*, Griff., indigenous in the higher lands of Assam and Cachar. Tea cultivation is a large and important industry which is increasing in extent every year.

*Dipterocarpeæ.*

*Dipterocarpus pilosus*, Roxb., and *Shorea assamica*, Dyer, both lofty trees yielding good timber.

*Malvacæ.*

*Malva verticillata*, L.; various species of *Sida* common to all the hotter parts of India; *Urena lobata*, L.; Cotton (*Gossypium herbaceum*, L.), of very poor quality. is grown both in the lower hills and plains. *Kydia calycina*, Roxb., grows at Makúm; *Bombax malabaricum*, DC., a large soft-wooded tree is common throughout the Assam Valley.

*Sterculiacæ.*

*Sterculia urens*, Roxb.—A strong coarse fibre is obtained from the bark and large quantities of a clear gum exude from cut surfaces. *Sterculia villosa*, Roxb.; *Sterculia Roxburghii*, Wall, are two other species of the genus. *Pterospermum acerifolium*, Willd., is a large tree. *Abroma augusta*, L., is a small bush yielding good fibre.

*Tiliacæ.*

*Grewia excelsa*, Vahl., and other species. *Triumfetta pilosa*, Roth.

*Echinocarpus sterculiaceus*, Bth., common at Sadiya; several species of *Elæocarpus*.

*Malpighiaceæ.*

*Aspidopterys nutans*, Hook. f., a large climber.

*Geraniaceæ.*

*Oxalis corniculata*, L., a common weed in waste places.

*Impatiens tripetala*, Roxb., in damp forests near rivers.

*Rubiaceæ.*

*Zanthoxylum Hamiltonianum*, Wall., an extensively scandent, armed shrub. *Glycosmis pentaphylla*, Correa, an extremely common small tree, especially at Sadiya; *Micromelum pubescens*, Bl., *Lrvunga scandens*, Ham., a strong climber.

*Burseraceæ.*

*Garuga pinnata*, Roxb. *Canarium bengulense*, Roxb.

*Meliaceæ.*

The following trees all yield good timber useful for many purposes.

*Melia Azadirachta*, L., commonly planted; *Dysoxylum binectariferum*, Hk. f., *D. procerum*, Hiern, *Amoora Rohituka*, W. and A., *Cedrela Toona*, Roxb.

*Olacineæ.*

*Erythropatum vagum*, Mast., a common climber at Sadiya; *Lepionurus oblongifolius*, Mast., a tree common in copses at Sadiya; *Miquelia Kleinii*, Meissn., a common climber at Sadiya; *Natsiatum herpeticum*, Ham., also common at Sadiya.

*Celastrineæ.*

*Celastrus paniculata*, Willd., and *C. monosperma*, Roxb., both large climbers.

*Rhamnaceæ.*

*Zizyphus jujuba*, Lamk.

*Zizyphus funiculosa*, Ham., and *Z. rugosa*, Lamk., both strongly armed, wide rambling shrubs.

*Ampelideæ.*

Several species of *Vitis*; *Leea sambucina*, Willd., and other species.

*Sapindaceæ.*

*Cardiospermum Halicacabum*, L., *Erioglossum edule*, Bl., a tree of Makúm forest, *Allophyllus zeylanicus*, L., a shrub of the same locality.

*Æsculus punduana*, Wall., common throughout the valley. *Sapindus attenuatus*, Wall., occurs in Makum as a straggling shrub.

*Turpinia pomifera*, DC. This tree is exceedingly common in the Makum forest.

*Sabiaceæ.*

*Sabia lanceolata*, Colebr., a climber. *Meliosma simplicifolia*, Roxb., a common tree in Makúm.

*Anacardiaceæ.*

*Mangifera indica*, L., cultivated. *Tapiria hirsuta*, Hk. f., a large climber.

*Odina Wodier*, Roxb., *Drimycarpus racemosus*, Hk. f.; *Spondias mangifera*, Willd.

*Leguminosæ.*

I found very few examples of this order in flower or fruit during my tours, but the following (with others) occur in the district, *Crotalaria*; *Millettia*; *Lespedeza sericea*, Miq., at Sadiya; *Desmodium laxiflorum*, DC., and other species; *Mucuna*; *Erythrina indica*, Lam.; *Phaseolus*, *Dolichos*, and *Cajanus indicus*, Spreng., cultivated; *Flemingia*; *Dalbergia*; *Derris ferruginea*, Bth.; *Cæsalpinia*; *Cassia*, *Bauhinia*; *Mimosa*, *Acacia*, *Albizia*, *Pithecolobium*.

*Rosaceæ.*

*Prunus Jenkinsii*, Hk. f. and T., a tree at Sadiya. *Rubus lucens*, Focke, forms extensive thickets at Makúm. *Rubus lasiocarpus*, Sm., and *Rubus rosæfolius*, Sm., perhaps introduced in Sadiya. *Fragaria indica*, Andr., common in waste places, fruit very insipid. *Potentilla Kleiniana*, W. and A., not common at Sadiya, is perhaps introduced.

*Crassulaceæ.*

*Bryophyllum calycinum*, Salisb., only observed at Sadiya.

*Combretaceæ*

*Terminalia*; *Combretum chinense*, Roxb.; *Illigera* sp., a large climber at Makum, with broadly four-winged fruits.

*Myrtaceæ.*

*Psidium Guyava*, L., cultivated for its fruit ; several species of *Eugenia*.

*Melastomaceæ.*

*Melastoma malabathricum*, L., common in wooded parts of the district.

*Lythraceæ.*

Several species of *Ammannia* in rice fields. *Duabanga sonneratioides*, Ham., a tall tree of the Makúm and other forests. It yields good timber for tea boxes, etc.

*Punica granatum*, L., cultivated.

*Onagraceæ.*

*Fussia repens*, L., and *F. suffruticosa*, L.

*Passifloreæ.*

*Modecca trilobata*, Roxb., a climber.

*Cucurbitaceæ.*

*Hodgsonia heteroclita*, Hk. f. and T., a large climber in forests. The seeds are edible after roasting and taste like nuts.

*Trichosanthes palmata*, Roxb., *T. cordata*, Roxb., common climbers. *Momordica Charantia*, L., cultivated ; *Cucumis sativus*, L., and *Cucurbita Pepo*, DC., also cultivated ; *Mukia scabrella* ; Arm., a common small climber ; *Zehneria umbellata*, Thwaites, another small climber remarkable from its polymorphous leaves. *Thladiantha dubia*, Bunge, a common dense climber with bright yellow corollas ; *Actinostemma tenerum*, Griff., *Gynostemma pedata*, Bl., both weak climbers.

*Begoniaceæ.*

*Begonia Roxburghii*, A. DC., *B. silhetensis*, Clarke, both in damp forests.

*Umbelliferæ.*

*Hydrocotyle asiatica*, L., *Seseli daucifolium*, C. B. C. *Ænanthe stolonifera*, Wall., *Ænanthe benghalensis*, Benth.

*Araliaceæ.*

*Aralia Thomsonii*, Seem., at Makum; *Acanthopanax aculeatum*, Seem., a common climber at Sadiya; *Heptapleurum venulosum*, Seem., variety *macrophylla*, a very large climber at Makum.

*Cornaceæ.*

*Marlea begoniæfolia*, Roxb., a small tree at Makum.

*Caprifoliaceæ.*

*Sambucus javanica*, Bl., a large virgate shrub; *Viburnum Colebrookianum*, Wall., a shrub at Makum.

*Rubiaceæ.*

*Anthocephalus Cadamba*, Miq., a large tree; *Uncaria sessilifructus*, Roxb., *Uncaria macrophylla*, Wall., large climbers; *Wendlandia tinctoria*, D C., *W. paniculata*, DC., small trees; *Hedyotis scandens*, Roxb., a small climber; *H. vestita*, Br., *H. Auricularia*, L., *H. hispida*, Retz., *H. monocephala*, Br., are all weeds; various species of *Oldenlandia* in rice fields; *Spiradiclis bifida*, Kurz., at Makum; various species of *Ophiorrhiza*, of which *O. oppositiflora*, Hk. f., the most interesting is common in shady places at Makum; *Muscænda* of several species; *Myrioneuron nutans*, Wall.; several species of *Randia*; *Gardenia campanulata*, Roxb.; several species of *Ixora*; *Pavetta indica*, L., *Coffea bengalensis*, Roxb., common at Sadiya; *Psychotria fulva*, Ham., *P. calocarpa*, Kurz., *P. denticulata*, Wall., at Makum and Sadiya; *Saprosma ternatum*, Hk. f., at Makum and Sadiya; *Pæderia tomentosa*, Bl.

*Compositæ.*

*Ethulia conyzoides*, L.; several species of *Vernonia*, mostly small plants, but *V. arborea*, Ham., is a small tree. *Ageratum conyzoides*, L., some species of *Blumea*; *Gnaphalium luteo-album*, L., and *G. indicum*, L., gregarious weeds in dry places; *Xanthium strumarium*, L., common on roadsides; *Siegesbeckia orientalis*, L.; *Eclipta alba*, Hassk.; *Spilanthus Acnella*, L., *Bidens pilosa*, L.; *Cotula hemisphærica*, Wall.; *Artemisia vulgaris*, L.; *Saussurea affinis*, Spreng.; *Crepis japonica*, Benth.; *Sonchus oleraceus*, Linn.

*Campanulaceæ.*

*Lobelia affinis*, Wall. *Lobelia rosea*, Wall.

*Myrsinæ.*

*Mæsa indica*, Wall.; several species of *Ardisia*.

*Styracææ.*

*Symplocos spicata*, Roxb., *S. racemosa*, Roxb.; *Styrax serrulatum*, Roxb., a small tree in Makúm.

*Oleaceæ.*

Several species of *Jasminum*; *Linociera macrophylla*, Wall., common at Sadiya, *Olea dioica*, Roxb.; *Myxopyrum smilacifolium*, Bl., a common climber at Sadiya.

*Apocynaceæ.*

*Melodinus monogynus*, Roxb., a climber; *Alstonia scholaris*, Br., a common soft-wooded milky tree; *Ecdysanthera micrantha*, A.DC., a large climber at Makúm; *Trachelospermum fragrans*, Hook. f., in the same locality.

*Asclepiadaceæ.*

*Cryptolepis Buchanani*, Ræm. and Sch., a small climber; *Asclepias Curassavica*, L.; introduced from the West Indies, now naturalized throughout the tropics; *Dischidia benghalensis*, Colebr.

*Loganiaceæ.*

*Buddleia asiatica*, Lour.; *Fagraea obovata*, Lour., a large scandent shrub in Makúm.

*Boraginaceæ.*

*Cordia Myxa*, L., a common tree at Sadiya; *Tournefortia viridiflora*, Wall.; *Heliotropium indicum*, L.; *Cynoglossum glochidiatum*, Wall., at Sadiya.

*Convolvulaceæ.*

Various species of *Argyreia*, *Lettsomia*, *Ipomæa*, *Porana*, *Cuscuta reflexa*, Roxb., is common.

*Solanaceæ.*

*Solanum nigrum*, L., a common weed; *Solanum verbascifolium*, L., *S. torvum*, Sw.; *S. indicum*, L.; *Solanum Melongena*, L., cultivated; *Lycopersicum esculentum*, Miller, cultivated; *Physalis minima*, L., common at Sadiya; *Physalis peruviana*, L., cultivated; *Capsicum frutescens*, L., cultivated; *Nicotiana Tabacum*, L., cultivated.

*Scrophularineæ.*

*Mimulus nepalensis*, Benth.; *Mazus rugosus*, Lour.; *Limnophila Roxburghii*, G. Don, and other species in wet places; *Torenia peduncularis*, Bth., *Torenia flava*, Ham.; *Vandellia crustacea*, Bth.; *Vandellia pedunculata*, Bth.; *Scoparia dulcis*, L., on waste ground only.

*Lentibulariæ.*

Several species of *Utricularia* in rice swamps.

*Gesneraceæ.*

*Æschynanthus gracilis*, Parish; *Bœica filiformis*, Clarke; *Rhynchochotechum ellipticum*, A.DC., and *R. vestitum*, Hk. f. and T. They are all found in dense forests.

*Bignoniaceæ.*

*Oroxylum indicum*, Vent., a small tree with long sword-shaped capsules; *Stereospermum chelonoides*, DC., very common at Sadiya. Canoes are made from the stems and the timber is moderately good for most purposes.

*Acanthaceæ.*

*Thunbergia alata*, Bojer, a small climber at Sadiya; *T. grandiflora*, Roxb., and *T. coccinea*, Wall., both common large climbers in forests; *Nelsonia campestris*, Br., a common weed; *Hygrophila polysperma*, T. Anders.; *Dædalacanthus nervosus*, T. Anders., at Makúm; *Acanthus leucostachyus*, Wall., at Makúm, near the coal mines, not common; *Codonacanthus pauciflorus*, Nees, at Makúm. *Phlogocanthus curviflorus*, Nees, *P. thyrsiflorus*, Nees, *P. asperulus*, Nees; *Lepidagathis hyalina*, Nees; *Justicia Gendarussa*, Linn. f.; *Adhatoda vasica*, Nees; *Rungia parviflora*, Nees, var., *pectinata*; *Dicliptera Roxburghiana*, Nees.

*Verbenaceæ.*

*Lippia nodiflora*, Rich., *L. geminata*, H. B. K.; *Verbena officinalis*, L., common in waste places; *Callicarpa arborea*, Roxb.; *C. macrophylla*, Vahl.; *Tectona grandis*, Linn. f., cultivated only; *Gmelina arborea*, L., yields good timber and the wood is valued for turnery; *Vitex Negundo*, L.; *Clerodendron infortunatum*, Gærtn., and other species.

*Labiatae.*

Several species of *Ocimum*; *Plectranthus ternifolius*, Don., common at Sadiya; *Pogostemon parviflorus*, Bth.; *Elsholtzia blanda*, Bth., at Talap; *Perilla ocimoides*, L., cultivated; *Anisomeles ovata*, Br.; *Leonurus sibiricus*, L., *Leucas linifolia*, Spreng.; *Gomphostemma parviflorum*, Wall.

*Nyctagineae.*

*Boerhaavia repens*, L.

*Amarantaceae.*

*Celosia argentea*, L.; *C. cristata*, L.; *Amarantus spinosus*, L., and other common species; *Alternanthera sessilis*, Br.

*Chenopodiaceae.*

*Chenopodium album*, L., cultivated, also common as an escape; *Basella rubra*, L., cultivated

*Polygonaceae.*

*Polygonum plebejum*, Br., *P. orientale*, L., *P. glabrum*, Willd., *P. barbatum*, L., *F. Posumbu*, Ham., and a few more species, all common on river banks and in swampy places. *Rumex maritimus*, L., *R. dentatus*, L., in wet places.

*Aristolochiaceae.*

*Aristolochia Roxburghiana*, Klotzsch, *A. saccata*, Wall.

*Piperaceae.*

*Houttuynia cordata*, Thumb., at Sadiya; several species of *Piper*.

*Chlorantaceae.*

*Chloranthus officinalis*, Bl.

*Myristicaceae.*

*Myristica longifolia*, Wall., a common tree at Makúm.

*Laurineae.*

*Cryptocarya amygdalina*, Nees; *Cinnamomum obtusifolium*, Nees, common at Makúm; *Machilus bombycina*, King; throughout the district and province. The "muga" Silkworms are fed with its

leaves; *Actinodaphne obovata*, Bl., a small tree with large glaucous leaves, common at Makúm. *Litsæa citrata*, Bl., common at Makúm; *Litsæa polyantha*, Juss., a very common tree; *Litsæa salicifolia*, Roxb., *L. oblonga*, Wall., and other species.

#### *Loranthaceæ.*

Several species of *Loranthus*.

#### *Euphorbiaceæ.*

*Euphorbia hypericifolia*, L.; *E. pilulifera*, L.; *Bridelia retusa*, Spreng.; *B. assamica*, Hk. f., common at Makúm as a small, spreading tree; *Phyllanthus reticulatus*, Poir.; *P. Emblica*, L., *P. urinaria*, L.; some species of *Glochidion*; *Breynia patens*, Bth.; *Bischofia javanica*, Bl.; *Antidesma diandrum*, Roth., and other species; *Baccaurea sapida*, Muell. Arg.; *Croton oblongifolius*, Roxb.; *Croton caudatus*, Geisel.; *Alchornea tiliæfolia*, Muell. Arg.; *Trewia nudiflora*, L.; *Mallotus Roxburghianus*, Muell. Arg.; *M. albus*, Muell. Arg.; *M. philippinensis*, Muell. Arg.; *Cleidion javanicum*, Bl.; *Macaranga denticulata*, Muell. Arg.; *Homonoia riparia*, Lour.; *Ricinus communis*, L., cultivated; *Sapium baccatum*, Roxb.

#### *Urticaceæ.*

*Trema amboinensis*, Bl., a short lived, quickly growing tree; *Cannabis sativa*, L.; *Morus indica*, L.; *Morus lævigata*, Wall., a large tree yielding excellent timber; many species of *Ficus*; *Artocarpus integrifolia*, Linn. f., cultivated; *Artocarpus Chaplasha*, Roxb.; *Conocephalus suaveolens*, Bl.; *Laportea crenulata*, Gaud.; *Girardinia heterophylla*, Dcne; *Pilea peploides*, Hk. and Arn.; *Elatostemu sessile*, Forst, and other species; *Bæhmeria nivea*, Hk. and Arn., cultivated; *Bæhmeria macrophylla*, Don; *B. platyphylla*, Don; *Pouzolzia indica*, Gaud., and other species; *Sarcochlamyx pulcherrima*, Gaud.; *Villebrunea integrifolia*, Gaud.

#### *Cupuliferæ.*

*Quercus Listeri*, King, is recorded (amongst other localities) from Makúm and Sadiya. *Castanopsis indica*, A. DC., and *Castanopsis tribuloides*, A. DC., are both common.

#### *Salicinæ.*

*Salix tetrasperma*, Roxb.

#### *Hydrocharidæ.*

*Hydrilla*, *Vallisneria*, *Ottelia alismoides*, Pers.

*Orchidaceæ.*

Many species of *Dendrobium* and *Bulbophyllum*; *Phajus Wallichii*, Ldl., *Pholidota imbricata*, Ldl.; *Eulophia*; *Cymbidium aloifolium*, Swartz; *Geodorum*; *Rhynchostylis retusa*, Bl.; *Ærides*; *Saccolabium*; *Sarcanthus secundus*, Griff.; *Zeuxine sulcata*, Ldl.; *Goodyera procera*, Hk., *Pogonia*, etc.,

*Scitamineæ.*

Several species of *Curcuma*, wild and cultivated; *Kæmpferia*; *Zingiber officinale*, Roscoe, cultivated; *Costus speciosus*, Smith; *Alpinia*; *Phrynium*; *Canna indica*, L., cultivated; *Musa Sapientum*, L., several varieties cultivated, *Musa rosacea*, Jacq, at Makúm.

*Hæmadoraceæ.*

*Peliosanthes Teta*, Andr.; *Curculigo recurvata*, Dryand; *Crinum*.

*Dioscoraceæ.*

Several species of *Dioscorea*, wild and cultivated.

*Liliaceæ.*

*Smilax*; *Dracæna angustifolia*, Roxb.; *Dracæna petiolata*, Hook. f.

*Commelinaceæ.*

*Pollia subumbellata*, Clarke; *Commelina nudiflora*, L., and other species; *Anilema nudiflorum*, Br., and other species; *Forrestia*; *Cyanotis*.

*Palmæ.*

*Areca Catechu*, L., cultivated; *Pinanga gracilis*, Bl.; *Wallichia densiflora*, Mart.; *Wallichia disticha*, T. Anders.; *Caryota urens*, L.; *Phænix sylvestris*, Roxb., cultivated; *Livistona Jenkinsiana*, Griff.; *Calamus* of several species.

*Arodeæ.*

*Amorphophallus bulbifer*, Bl.; *Colocasia antiquorum*, Schott., cultivated; *Colocasia Mannii*, Hk. f. (recorded from Makúm); *Alocasia*; *Scindapsus*; *Rhaphidophora*; *Lasia heterophylla*, Schott.; *Pothos scandens*, L.; *Pothos Cathcartii*, Schott.

*Lemnaceæ.*

*Lemna*, growing on the surface of stagnant ponds.

*Alismaceæ.*

*Alisma* ; *Sagittaria* ; in rice fields and swamps.

*Naiadaceæ.*

*Aponogeton* ; *Potamogeton* ; in shallow ponds.

*Cyperaceæ.*

This order is represented by most of the genera and species common to the warmer parts of India.

*Gramineæ.*

In point of importance as regards appearance and utility the Bamboos occupy the chief place. They form a characteristic feature of the Flora of Upper Assam. They are often widely gregarious and their culms are applied to multifarious uses by the natives.

*Dendrocalamus giganteus*, Munro, and *Dendrocalamus Hamiltonii*, Nees and Arn, exceed all in size and height. *Pseudostachyum polymorphum*, Munro, is very common on the outer skirts of the Makúm forest where I was fortunate enough to find it in flower. Other common species are *Bambusa Tulda*, Roxb., *Bambusa Balcooa*, Roxb., *Cephalostachyum pergracile*, Munro, and *Phyllostachys Mannii*, Gamble.

I am indebted to Mr. Gamble for the identification of the bamboos collected during this tour.

The tall grasses covering large tracts of low-lying country belong to the genera *Imperata*, *Saccharum*, *Arundo* and *Anthistiria* (*Androscepia*). Their culms and leaves are used in house building as I have already pointed out.

The smaller grasses consist of various species of *Paspalum*, *Panicum*, *Pennisetum*, *Eragrostis*, *Coix*, *Cynodon*, *Setaria* and other genera.

Although there are large areas which could be utilized for grazing grounds where one would expect the cattle to be of a good class, the cattle are certainly the most degenerated I have seen in India.

*Filices.*

This district is rich in ferns as might be inferred from its climate and situation. As in most parts of the world the plants of this order shun the open cultivated tracts and usually frequent the forests.

A total number of about one hundred species has been recorded from Upper Assam. Some collected in recent years by Mr. Gustav Mann are rare and may yet prove to be forms or varieties of species already known to us.

The geographical affinities of the higher Cryptogamic Flora coincides with that of the flowering plants.

The following species extend from the Eastern Himalayas and Assam throughout the Malayan Peninsula. *Gleichenia linearis*, Burm., *Alsophila glauca*, Sm., *A. glabra*, Hk., *Dicksonia Barometz*, Link., *Davallia divaricata*, Bl., *Lindsaya repens*, Desv., *L. ensifolia*, Sw., *Adiantum lunulatum*, Burm., *Onychium auratum*, Kaulf., *Pteris longifolia*, L., *P. cretica*, L., *P. pellucida*, Presl., *P. ensiformis*, Burm., *P. semi-pinnata*, L., *P. quadriaurita*, Retz., *P. biaurita*, L., *P. incisa*, Thumb., *Ceratopteris thalictroides*, Burm., *Blechnum orientale*, L., *Asplenium Nidus*, L., *A. longissimum*, Bl., *A. nitidum*, Sw., *A. bantamense*, Baker., *A. polypodioides*, Mett., *A. latifolium*, Don., *A. esculentum*, Presl., *A. Finlaysonianum*, Hk., *Aspidium vastum*, Bl., *A. variolosum*, Wall., *A. heterosorum*, Hk. and Bk., *A. decurrens*, Presl., *A. cicutarium*, Sw., *A. membranifolium*, Mett., *Nephrodium Leuzeanum*, Hk., *N. calcaratum*, Bl., *N. ochthodes*, Hk., *N. syrmaticum*, Baker., *N. Blumei*, Bedd., *N. tenericaule*, Hk., *N. unitum*, R. Br., *N. aridum*, Hk., *N. moulemeinense*, Bedd., *N. molle*, Desv., *N. amboinense*, Presl., *N. procurrens*, Hk., *N. crinipes*, Hk., *N. truncatum*, Presl., *Nephrolepis cordifolia*, Hk., *N. exaltata*, Schott., *N. acuta*, Presl., *Polypodium punctatum*, L., *P. proliferum*, Roxb., *P. adnascens*, Sw., *P. stigmatosum*, Sw., *P. fissum*, Hk., *P. nummulariæfolium*, Mett., *P. quercifolium*, L., *P. lineare*, Thunb., *P. superficiale*, Bl., *P. pteropus*, Bl., *P. longissimum*, Bl., *P. nigrescens*, Bl., *P. leiorkhizon*, Wall., *Gymnogramme Hamiltoniana*, Hk., *Meniscium triphyllum*, Sw., *Antrophyum reticulatum*, Kaulf., *A. latifolium*, Bl., *Vittaria elongata*, Sw., *Vittaria scolopendrina*, Presl., *Drymoglossum piloselloides*, Presl., *Acrostichum palustre*, L., *A. appendiculatum*, Willd., *A. variabile*, Hk., *A. axillare*, Cav., *A. flagelliferum*, Wall., *Lygodium microphyllum*, R. Br., *Angiopteris evecta*, Hoffm., *Kaulfussia æsculifolia*, Bl., *Helminthostachys æylanica*, L.

The following Assam Ferns are found in the Chinese Florá, *Davallia Griffithiana*, Hk., *D. Hookeriana*, Wall., *D. Speluncæ*, Baker., *D. chinensis*, Sw., *Lindsaya orbiculata*, Lam., *Adiantum caudatum*, L., *A. flabellulatum*, L., *Cheilanthes varians*, Hk., *C. tenuifolia*, Sw., *Pteris longifolia*, L., *P. cretica*, L., *P. aquilina*, L., *Asplenium lanceum*, L., *A. bantamense*, Baker., *A. esculentum*, Presl., etc.

A few species are more restricted in habitat so far as we know at present, thus, *Pteris Griffithii*, Hk., *Blechnum cartilagineum*, Sw., *Polypodium subfurfuraceum*, Hk., are more or less confined to Mishmee and its adjacent mountains.

**RECORDS**  
**OF THE**  
**BOTANICAL SURVEY OF INDIA.**

**PUBLISHED UNDER THE DIRECTION OF**  
**BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,**  
**DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.**



**VOLUME I.**

**No. 6.**

**NOTES ON A JOURNEY FROM POONA TO NAGOTNA,**

**BY**

**G. MARSHALL WOODROW.**



**CALCUTTA.**  
**OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.**  
**1895.**



74°

36°

35°



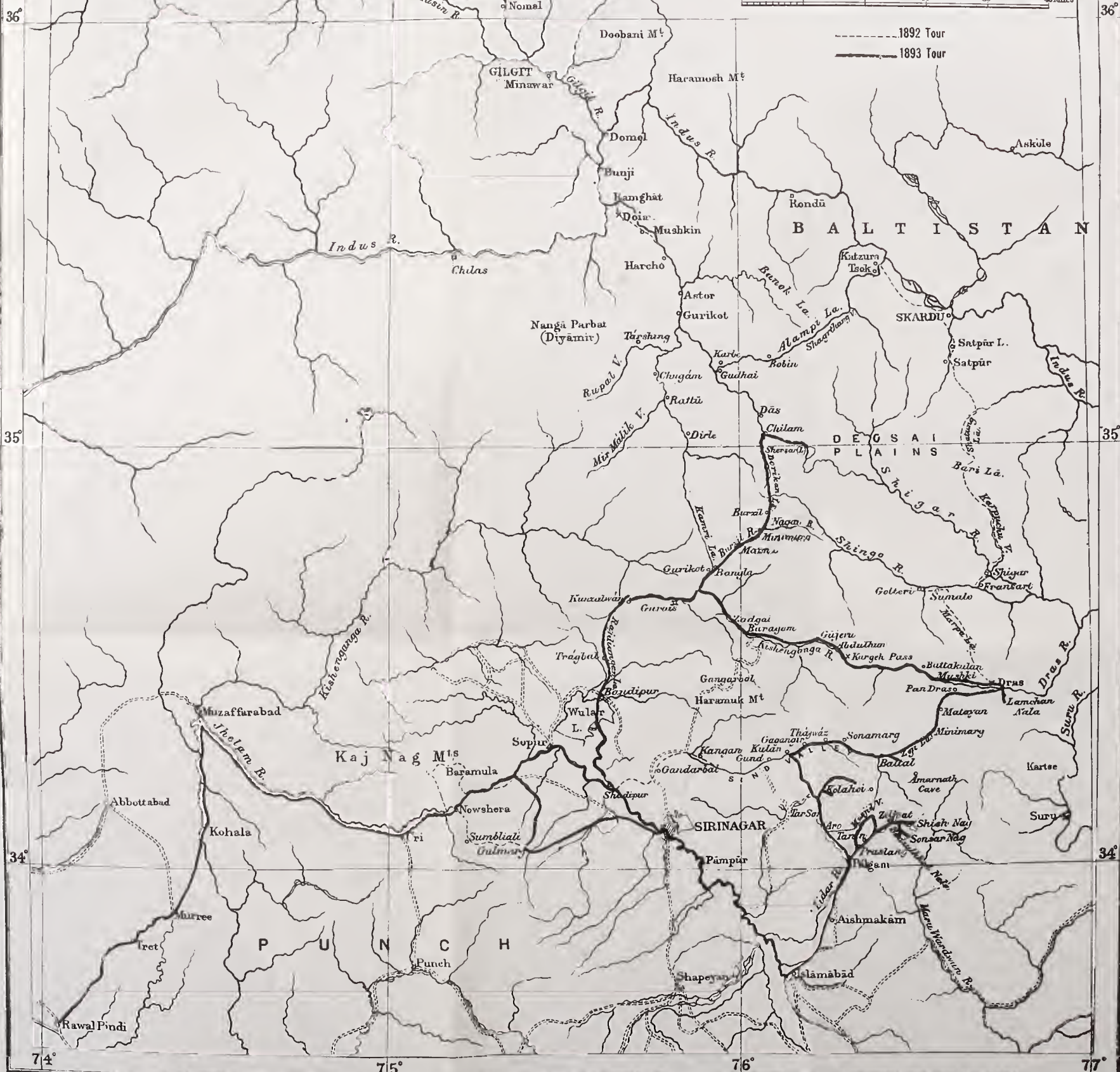


74° 75° 76° 77°

Map of  
PARTS OF KASHMIR, BALTISTAN, & GILGIT  
SHOWING THE ROUTES TAKEN BY THE DIRECTOR,  
BOTANICAL DEPT., N. INDIA, IN 1892 & 1893.

English Statute Miles (16 Miles to 1 Inch).  
0 5 10 20 30 40 Miles

----- 1892 Tour  
————— 1893 Tour





BOTANICAL NOTES  
ON A  
JOURNEY FROM POONA TO NAGOTNA  
IN  
DECEMBER 1894.

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On this journey I was accompanied by Mr Ranade, the Herbarium-keeper, and three of the College of Science Mallees; the latter were taken to assist in collecting and to induce an interest in the jungal plants they are required to cultivate.

The route lies near to the 18° North Latitude, and was selected because very little was recorded regarding the botanical character of the district it traverses.

On leaving Poona the road leads due westwards on the left bank of the Mutha river. On the outskirts of the city a great quantity of *Opuntia nigricans*, Haw., in ripe fruit was passed, and soon we were among fields irrigated by a canal from the Mutha; those are largely planted with Guava trees ten feet apart, and having been raised from seed, bearing fruit of variable size and flavour.

Fields of sugarcane are abundant, conspicuous from the pale yellowish green of the cane; the sort usually cultivated is called *Punda*, that is, stout; it is believed to have been introduced 50 years ago from Mauritius, and is widely distributed in India under the name *Bombay cane*. At intervals occurs a majestic *Peepul*\* with a stage built round it, usually in this district in very bad repair, and a singular form of *Babul*† resembling the Lombardy Poplar, with abundance of the American weed *Ageratum conyzoides*, Linn.

At the village of Kotrood near by considerable nurseries of fruit trees have long been established: the Orange tribe in variety, Guava and Pomegranate trees are produced in quantity, but they have scarcely begun the propagation of the Mango by grafting, which is carried on largely by old pupils of the Ganeshkhind Garden established on the Poona-Kirkee road.

On the banks of the irrigation canal *Mohl*‡ is abundant, and *Exacum pedunculatum*, Linn., is conspicuous from its large Solanum-like anthers. The grasses are closely grazed, permitting the repent *Heylandia latebrosa*, D.C., to show its yellow flowers, and *Gymnos-*

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\* *Ficus religiosa*.

† *Acacia arabica*, Willd.

‡ *Pennisetum alopecurus*, Steud.

*poria montana*, Roxb., Marathi, *Hekal* or *Hælee*, a large shrub in the hedges, is in full bloom; its odour is agreeable at a little distance. Small Sandalwood trees\* with *Moriada citrifolia*, L., *Cordia myxa*, L., and *Acacia leucophlæa*, Willd., are near by with *Rivea hypocrateriformis*, Choisy., climbing over them. On the road women of the Katkari tribe were met carrying loads of the branches of *Lantana Camara*, L., which are used for making baskets.

At the 9th mile the road crosses a range of hills which afford a good view of Poona. In the foreground the temple of Parvati is conspicuous on a hill, but the city and camp appear a forest of round-headed trees relieved by a few church spires, mosques and temples; its two factory chimneys and three colleges sufficiently indicate the clerical leaning of the people. The pretty little *Rungia elegans*, Dalz., is abundant here, peeping from the shelter of stones and bushes with flowers of every shade from white to deep purple in second spikes.

We are now on the edge of the Mawal district, the land of the setting sun. The country here is very beautiful—short broken ranges of flat-topped trap hills with few trees, but bearing grasses that feed large herds of small hardy cows and heavy browed buffalows. The grasses are closely grazed, but are chiefly *Anthistiria ciliata*, L. f., here called *Bongarat*, *Andropogon scandens*, R., the *Marwail* of the Marathas, which is not scandent here, and *Apluda aristata*, Linn. The lower part is terraced, and the big Deccanee plough is at work breaking up after jowaree; on the banks *Sarcostemma brevistigma*, W. and A., spreads its leafless branches; in the stubble are *Hibiscus cannabinus*, Linn., the pulse *Mutkee*, *Celosia argentea*, Linn., *Sopubia delphinifolia*, G. Don., *Pulicaria Wightiana*, C. B. C., and *Heylandia lutebrosa*, D. C., *Eugenia rubicunda*, Wight; the *Lendee jambool*, so called from its fruit resembling sheep dung, was met here as a small tree; further westward it is very abundant in a coppiced state on the banks of streams. *Eree Babool* considered to be a form of *Acacia arabica*, Willd., and its specific type were found here growing side by side. *Eree Babool* is of rapid growth with conspicuous lenticels in the young bark, which ultimately cracks deeply; its timber is comparatively soft and coarse-grained, its pods have a thickened margin not indented between the seeds, and it comes true to seed. That the difference is not due to local causes is evident, as they are to be frequently seen near together. Hare abound here, and as they spring away from one's feet they startle flocks of *Landeeree* (Grouse) from the bushes. On the hill sides the American

\* *Santalum album*, L.

*Lantana Camara*, Linn., is superabundant, and *Argyreia cuneata*, Ker, conspicuous, with at wide intervals stunted teak and jambool. In the same neighbourhood is to be found *Vitis repanda*, W. and A., *Girnool* of the Marathas which has given local botanists much trouble from its variable character; the following notes regarding it may be taken as supplementary to the description in the *Flora of British India*, Vol. I, fol. 648: A shrub, with a stout erect stem attaining 5—6 feet in height, with rugged bark and producing annual branches 2—3 feet in length,  $\frac{1}{2}$  inch in diameter at the base, which die back during the dry season. Its root is large fusiform and succulent, its leaves attaining 8 x 8 inches, cordate, coarsely and irregularly bi-serrate with curved teeth directed apically, on petioles a little less than the length of the leaf with stipules  $\frac{3}{4}$  inch in length,  $\frac{1}{2}$  inch in breadth at the base, obtuse and slightly falcate, deciduous from a persistent ridge. The colour and degree of pubescence on stem and leaf are variable. The peduncle is about 4 inches in length, and bears about four simple or branched rays, each having about four fruits on  $\frac{1}{2}$  inch pedicels. The fruit is about  $\frac{1}{2}$  inch, obovate with persistent style base. Tendrils wanting. Flowers in June. Fruit in September. Its reputation that if the wood is used as fuel for an earthenware cooking pot, the pot will break, will assist its preservation. *Lagascea mollis*, Cav., another detestable American weed, was abundant, and a *Phyllanthus* occurred rarely. *Linum mysorensis*, Heyne, was met with at this place for the first time on this journey, and *Vishnoo-krant*\* for the last time, those showing the border land between dry and wet regions. *Lepidagagthis cristata*, Willd., showed its remarkable cushion-like inflorescence among the stones. This is one of the homes of *Gloriosa superba*, L., but at the beginning of December there was scarcely a vestige of the stems left. *Boswellia serrata*, Roxb., in company with *Euphorbia neriifolia*, L., is abundant, and climbing over both the showy *Cylista scariosa*, Ait., was seen conspicuous from its white bracts. On the tops of the hills patches of *Guizotia abyssinica*, Cass., named *Kala teel* in this district, were ripening, and Marwait† and Mota Bongarat‡ were prominent grasses; *Vicoa auriculata*, Cass., occurred frequently, and *Hemidesmus indicus*, Br., was seen occasionally: the latter variable in foliage, but easily identified by the characteristic agreeable odour of its root. *Polycarpæa corymbosa*, Lamk., was plentiful, and as a weed in cultivated parts *Goniocaulon glabrum*, Cass., with its erect angular stem 3—6 feet in height, *Cæsulia axillaris*, Roxb., and *Vernonia*

\* *Evolvulus alsinoides*, Linn.

† *Andropogon scandens*.

‡ *Anthistia ciliata*, L. f.

*indica*, Læss, were common. *Buchnera hispida*, Ham, springing up near *Kurwanda*\* bushes, a few specimens of the sacred *Apta*† and a solitary stunted specimen of *Gmelina arborea* with abnormally coarsely dentate leaves complete the list on that hill.

Water is found only at long distances on those hill ranges, and the pools are generally muddy from the feet of cattle. On that morning I was suffering from a cold and the fierce thirst endured was a warning not to go out again without a flask. The road having been regained, a walk of 5 miles, crossing a range of dry treeless hills at Pirangootche Khind (the pass of Pirangoot), brought me to Pirangoot village at 2 o'clock in the afternoon, much fatigued from being on foot since daylight. Here I met Mr. Ranade who had taken the opposite side of the road and lower altitude, and found *Echinops echinatus*, D.C., *Indigofera trita*, L., *Cocculus villosus*, D.C., *Ammania multiflora*, Roxb., *Oldenlandia corymbosa*, Linn., *Stemodia viscosa*, Roxb., *Clerodendron serratum*, Spreng., *Ipomæa obscura*, Ker, in addition to several mentioned above. Onward in the evening, and Paud, a large village, was reached late at night. The Moola river passes this and joins the Mootha at Poona; those flow to the Bheema which swells the volume of the Krishna. Mr. Ranade took the banks of the river and found *Crinum ensifolium*, Roxb., *Cryptocoryne Roxburghii*, Schott, the yellow *Cyathocline* rare and the purple one abundant—positions which were changed when the line of the ghats with its heavy rainfall was approached, *Coix Lacrymæ*, L., *Phyllanthus reticulatus*, Poir., *Ophiurus corymbosus*, Gært., *Desmodium diffusum*, D.C., *Alysicarpus pubescens*, Law, *Salvia plebeja*, Br., *Alternanthera sessilis*, Br., *Eclipta alba*, Hassk., and *Tricholepis glaberrima*, D.C.—the latter has pellucid glands not easily observable in dried specimens, *Dentella repens*, Forst., *Achyranthes aspera*, Linn., in fruit; *Flemingia strobilifera*, R. Br., was noted on the margin of rice fields. *Xanthium strumarium*, Linn., and *Psoralea corylifolia*, Linn., were abundant enough to be ornamental with occasionally *Pimpinella adscendens*, Dalz., and the centre was carpeted with *Hygrophila serpyllum*, T. Anders. *Plumbago zeylanica*, L., was seen, and *Andropogon lancifolius*, Trin., with its short dense growth and flowers abundant enough to give a purple tinge to the sod. *Spilanthes Acmeila*, Linn., was seen occasionally; of *Smithia purpurea*, Hook a solitary outlying specimen was found, its home is with the heavy rain further west. *Indigofera linifolia*, Retz., was abundant in dry soil, but we appeared to have left *Heylandia* behind.

\* *Carissa Carandas*.

† *Bauhinia racemosa*.

I climbed a hill near by and found lots of *Euphorbia neriifolia*, Linn., and abundant *Mohl* grass. I have hitherto found this grass in wet land only, but on this steep hill side it occurs in patches half an acre in extent, to the exclusion of other herbage. The paper manufacturers of Poona saw this would be a good paper material were it not for the presence of some knots that do not yield to the ordinary treatment; but as it can be obtained in large quantity at a low price, there is little doubt the ingenuity of the manufacturers will ere long overcome the difficulty. After a long scramble upwards through *Mota Bongarat* grass as high as the waist, *Rivea ornata*, Chois., was found in fruit, and *Blepharis asperrima*, Nees, was seen creeping among the stones, and the first ferns met with on this journey were seen *Adiantum lunulatum*, Burm., and *Cheilanthes farinosa*, Kaulf. *Artemisia parviflora*, Roxb., locally called Tail Downa, and *Artemisia vulgaris*, Linn., Dhor Downa, were seen. Bhos,\* a grass 6 feet in height, is found here, but is more abundant further west, and *Crotalaria Leschenaultii*, D.C., was met occasionally.

On leaving the village *Erythrina suberosa*, Roxb., was met with, and it led to the reflection that this is the only species I could vouch for being indigenous in Western India. *E. indica*, Lam., is common enough planted, and *E. stricta*, Roxb., is said to be common in southern districts, but I have not seen it.

In the rays of the rising sun the fields of young wheat are sparkling like polished silver with the reflection from the "dew drops." On the young wheat it is a single large drop on the point of each nearly upright leaf, the remainder of the leaf being dry. On young Jowaree† the water occurs in large drops at intervals on the undulating margin, some of the drops occupying the highest part of the curve. Both surfaces are wet, the lower much more than the upper and the aftermath of rice was wet all over. Much of this "dew" is evidently derived from water pores.

Here we met the Kolisra, a remarkably tame bird, half the size of a crow, black, with a yellow beak and divergent tail feathers.

On the way *Triumfetta rhomboidea*, Jacq., *Ficus gibbosa*, Blume, with *Solanum xanthocarpum*, Schrad., and a camphor-scented *Andropogon*, named Kendûr, *Desmodium triflorum*, D.C., *Lippia nodiflora*, Rich., *Polygonum glabrum*, Willd., *Flemingia strobilifera*, R. Br., *Pongamia glabra*, Vent., *Phyllanthus reticulatus*, Poir, called Nilambi, were found.

Arrived at Moolsee we encamped under a great *Ficus Tsjela*, Roxb., which had germinated on a mango, and with the aid of *Dalbergia*.

\* *Sorghum hulpanse*, Pers.

† *Sorghum saccharatum*, Pers.

*sympathetica*, Nimmo., had nearly crushed the life out of its host. In this neighbourhood were found *Ficus Arnottiana*, Miq., *Smilax macrophylla*, Roxb., *Tamarix ericoidea*, Roth, in the river bed; *Lasiosiphon eriocephalus*, Dcne, *Blepharis asperima*, Nees, *Albizia stipulata*, Boiv., *Solanum indicum*, Linn., *Vitex altissima*, L.f., *Garuga pinnata*, Roxb., *Sopium insigne*, Benth., *Jasminum arborescens*, Roxb., *Pavetta indica*, Linn., *Flueggea Leuopyrus*, Willd., *Sideroxylon tomentosum*, Roxb., *Indigofera pulchella*, Roxb., *Anisomeles Heyneana*, Benth., *Randia dumetorum*, Lamk., *Pogostemon parviflorus*, Benth., *Ficus asperima*, Roxb., *Cordia obliqua*, Willd., *Dalbergia sympathetica*, Nimmo., *Mucuna pruriens*, D.C.

The road terminates at Paud, 20 miles from Poona, and the last 7 miles had been a very rough track barely passable by lightly-laden carts; but from this onwards it appeared to be worse, so every dispensable article was sent back with the carts, and carriers employed for the remainder. Near Bhorkus *Cryptolepis Buchananii*, Roem. and Sch., *Phaseolus grandis*, Dalz. and Gibson, *Vitex Negundo* Linn., *Leea sambucina*, Willd., *Thespesia Lampas*, Dalz. and Gib., *Mukia scabrella*, Arn., *Hemidesmus indicus*, Br., *Ficus infectoria*, Roxb., *Ramphicarpa longiflora*, Benth., *Geissaspis cristata*, W. and A., *Colebrookia oppositifolia*, Sm., *Clematis gouriana*, Hook., *Allophyllus Cobbe*, Bl., *Leucas stelligera*, Wall., *Kæmpferia scaposa*, Benth., the latter had taken almost exclusive possession of a low muddy portion of the bank of a stream. It is also abundant in a similar position near Lanowlee railway station, where its fugacious white flowers may be seen in August.

From Bhorkus at a distance of 5—6 miles the outline of a palm was seen against the sky on the tops of the hills, and as the species of palms in Western India are few, this was easily recognized as a species not recorded in local floras, and we pushed on to get a nearer view. The nearest is nearly 1,000 ft. above the altitude of the valley; the mountains are immense trap dykes with the intervening rock washed away; the tops are level and the sides precipitous. To get to the top required the local knowledge of the village guides and a long stiff climb. The palm was found to be a species of *Phoenix* with a stem 25—30 ft. in height, 15 inches diameter, marked with very closely and spirally-arranged small leaf bases and having leaves glabrous, shining, shorter, broader, thinner and smoother than those of *Phoenix sylvestris*. It is called *Shælu*, and is the source of most of the so-called date-matting made in this district. It is gregarious and remarkable in its distribution; about 20 miles north and 30 miles south of this place. I have

thoroughly explored the country without finding it; probably it is the same palm as occurs in a dwarf state in North Kanara between Sirsi and Kumta and on the ghats east of Goa. It has been identified as *Phoenix robusta*, Hook. f.

A few miles from Bhorkus we crossed the Khadshee stream, and a fatiguing morning had a delightful recompense. The rocks were covered with *Podostemon Hookerianus*, Wedd., with about an inch of water flowing over it. The thalloid stems, in patches of vivid crimson, yellow and green with the clear water and bright sunshine, made a charming picture. On the rocks above the water line were dichotomously-branched white lines,  $\frac{1}{4}$  inch in breadth, so greatly resembling a lichen that I had previously taken it to be one; but a close examination showed it to be the dried up stems of the *Podostemon*. *Terniolu Lawii*, Wedd., was also abundant, covering rocks like a moss. Here the stream makes a leap of 10—15 ft. and has worn deep circular pools in the rock, which are alive with large fish; a species of *Barbus* and Murrel (*Ophiocephalus*) were easily distinguishable. The fish are considered sacred, and we were warned in a mysterious whisper not to linger near the place as it is believed to be under supernatural protection.

The valley Khor Barsa was occupied by rice-fields lately harvested. *Cyathocline lutea*, Law, gave a golden sheen to the banks and *Hygrophila serpyllum*, T.A., spread a green and purple carpet on the damp soil. The sides of the fields had abundant *Cyperaceæ* with a small *Eriocaulon* and *Geissapsis cristata*, W. and A., and around the cattle sheds are fences of *Adhatoda vasica*, Nees, and *Vitex Negundo*, Linn., intermingled with the large nettle *Girardinia heterophylla*, Dcne, and *Elephantopus scaber*, Linn., Marathi, Baltan; *Alysicarpus pubescens*, Law, was frequently seen.

At the western end of the Khor Barsa lies the village Tail Bayla, and a short distance further is a precipitous pass to the Concan, named Savashni Ghat. The distance from Tail Bayla to Dhonsa in the Concan is only  $2\frac{1}{2}$  miles as measured on the map, but it occupied six hours of the most severe toil. In that distance the descent is nearly 2,000 feet, and the path is as steep as a path may be. It is a veritable ladder of the roughest description, and to one not accustomed to such exercise fatiguing beyond measure. The joker of the party, however, was not sufficiently damped. He pathetically remarked the ancient philosopher who said it was easy to descend must be excused, he had never been on Savashni Ghat. While moving no one could look at anything but where he was placing his feet; but during the frequent halts were observed *Polytoca Cookei* confined to a narrow

line near the top, *Coix Lacrymæ*, Linn. *Erinocarpus Nimmoanus*, Grah., *Pimpinella adscendens* Dalz., *Careya arborea*, Roxb., *Justicia Betonica*, Var *ramosissima*, Linn., *Hemidesmus indicus* Br., *Blepharis asperrima*, Nees, *Bridelia retusa*, Spr., *Strobilanthes* sp., *Sterculia guttata*, Roxb., *Hibiscus hirtus*, Linn., *Vangueria spinosa*, Roxb., *Terminalia tomentosa*, Bedd., *Bæhmeria platyphylla*, Don., *Schleichera trijuga*, Willd. with *Viscum angulatum*, Heyne, growing on it, and *Woodfordia floribunda*, Salisb., *Panicum montanum*, *Paspalum* sp., *Heteropogon insignis*. *Vitis quinquefolia*, *Memecylon edule*, Roxb., *Caryota urens*, Linn.; *Tricholepis amplexicaulis*, C. B. C., as carefully studied with a view to finding Dalzell's *T. montana*; near the base of the mountains Teak.

At Dhonsa in the village tank the red *Nymphæa* was abundant in the centre, its shade of colour pale-pink, and *Ceratopteris thalictroides*, Linn., near the sides. On the banks the wide spread *Coix* and *Hygrophila spinosa* and *Lamprachænium microcephalum*, Benth., in fruit—its stiff feathered pappus makes an intolerable itching, and on a dead tree fallen over the water *Vanda parviflora* is abundant. In a well on the margin of the tank a heavy coating of *Lemna polyrrhiza*, Linn., floats on the surface, and beneath it is a very luxuriant example of *Nitella Roxburghii*, Al. Brun, the first we had met with. As the plant is of special interest to teachers of biology, we carried off abundant fresh specimens. On neighbouring trees fine specimens of *Rhyncostylis retusa*, Bl., were seen; by the sides of the fields *Tricholepis radicans* was abundant, past flower; *Hydrolea zeylanica* was showing its pretty blue flowers on the still moist rice-fields. The Mango was the commonest tree, but there were large examples of *Anona reticulata*, Linn., *Mimusops Elengi*, Linn., and of *Khair*. *Derris scanaens*, Benth., near the village, and frequently *Sterculia urens*, Roxb., *Marathi*, was met with, and the villagers showed us *Wakandee*, evidently an *Asclepiad*, with leaves 8×8 inches. We were now in the Concan only a few feet above the level of the sea and proceeded along the banks of rice-fields towards Pali. On the way *Elytrophorus articulatus* Beauv., *Careya arborea*, Roxb., *Dolichandrone falcata*, Seem, *Ipomæa Nil*, Roth., *Peristrophe bicalyculata*, Nees, *Barleria Prionitis* Linn., *Panicum interruptum*, Willd., *Smithia sensitiva*, Ait., *Epaltis divaricata*, Cass., *Holarrhena antidysenterica*, Wall., *Terminalia tomentosa*, Bedd., were seen.

Pali is a large village with abundant water in the soil and numerous tanks. Mango trees were abundant. *Spondias mangifera* showed extra luxuriant growth; *Lagerstræmia Flos-reginæ*, Retz, *Butea frondosa*, Roxb., *Leea macrophylla*, Roxb., *Luffa acutangula*,

Roxb., and in the tanks *Naias minor*, All. *Ceratophyllum demersum*, Linn., *Azolla pinnata*, *Pistia stratiotes*, Linn., Marathi "Gondal," *Ottelia alismoides*, Pers., *Lemna polyrrhiza*, Marathi "Neel." On the outskirts were found *Juncellus pygmæus*, Clarke, making a green carpet in dried up waterholes.

From Pali to Nagotna the country consists of rice-fields with patches of wood on uplands; but accurate observations could not be made, as all the party was suffering greatly from fatigue and exposure.

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#### NOTES FOR DR. WATT'S DICTIONARY.

*Synopsis of practical facts from the Report of the Botanical Survey, Bombay, for the year 1894-95.*

*Phoenix robusta*, Hook. f., Marathi Straelu.—Leaves of this palm only are generally used at Bombay and Poona in preparing "Date" matting.

*Amorphophallus commutatus*, Engler, Marathi Shewal.—The inflorescence is cooked with the leaves of *Lagerstræmia parviflora* and the fruit of *Garuga pinnata* and used as a vegetable.

*Sauromatum guttatum*, Schott.—The root, Marathi Nurki achakanda, is sold by Vaid; it is believed to increase the secretion of milk in cattle.

*Gloriosa superba*, Linn., Marathi Kulawai. Found on the hills 12 miles west of Poona.

*Pennisetum Alopecuros*, Steud, Marathi Mohl. Used for brooms, ropes, etc., recommended for paper making. It is abundant on poor wet land near Poona and on a hill side near Paud 20 miles west of Poona.

*Ischæmum angustifolium*, Haeckel, Sabai or Bhabur is cultivated at Poona for paper making.

*Agave Sisiliana*, Sisil hemp plant, introduced 1893, growing freely at Poona.

COLLEGE OF SCIENCE,  
POONA;  
The 7th June 1895. }

G. MARSHALL WOODROW.



RECORDS  
OF THE  
BOTANICAL SURVEY OF INDIA.

PUBLISHED UNDER THE DIRECTION OF  
BRIGADE-SURGEON G. KING, M.B., LL.D., F.R.S., C.I.E.,  
DIRECTOR OF THE BOTANICAL SURVEY OF INDIA.

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VOLUME I.

No. 7.

A NOTE ON INDIAN WHEAT-RUSTS.

BY

D. D. CUNNINGHAM AND D. PRAIN.



CALCUTTA:  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1896.



# A NOTE ON INDIAN WHEAT-RUSTS.

By D. D. CUNNINGHAM and D. PRAIN.

During the cold season of 1895-96, while one of us was engaged in conducting certain experimental cultures of wheat at the Government Farm, Shibpur, an opportunity was afforded of partially investigating some of the phenomena connected with "rust" in wheat. The results obtained, as will presently appear, are neither final nor, so far even as they go, complete. But if they do not clear up the difficulties that surround this subject, they seem to narrow in some degree the field of enquiry; in this respect therefore they may prove of some general interest and may perhaps to a certain extent be of use. The present note, which has been prepared in compliance with an order issued to Dr. Prain by the Government of India through the Government of Bengal, contains an account of our observations.

Owing to the exigencies of routine work at the Experimental Farm and, in some instances, owing to delay in the arrival of samples, the sowings were made rather late in the season. Of 82 patches, in which as many samples were tried, 27 were sown on October 31st, 1895; 21 on November 3rd; 11 on November 13th, and the remainder on November 25th. In each case the wheat was sown in parallel drills in long narrow plots.

In one of the plots of the third sowing it was noticed for the first time on January 14th, that some of the plants had become "rusty"; about six plants in each of three rows in the centre of the patch were then apparently affected. Two days later the "rust" was evident in adjacent patches; within a week it had appeared in every part of the wheat-field; in less than ten days it was not possible to find a single plant entirely free from "rust."

The subject of "rust" on Indian wheat is for both of us one of interest because of the attention it received from our lamented friend, the late Dr. Arthur Barclay. So soon therefore as one of us had noticed the presence of "rust" in this wheat-field and the other had ascertained that its structural and metric characters seemed to be those indicative of the Indian "rust" identified by Dr. Barclay with *Puccinia rubigo-vera* (Journal of Botany, vol. 30, p. 46, 1892), it became our object, if possible, to ascertain the source of the blight.

Attention was directed to the onset of the attack by the appearance of the affected plants. The leaves that form a tuft close to the soil and surround the bases of the culms seemed within 24 hours to have become suddenly wilted and yellow, the soil in a circular patch round the base of the plant having at the same time become of a rusty-red colour. Close examination of the plants showed that the blades of these yellow and suddenly-wilted leaves were completely inrolled from the margins; on their being flattened out it was seen that the upper surface of the blade was closely covered by an eruption of small circular orange-red pustules; the rusty hue imparted to the soil in the immediate neighbourhood of the plant was found to be due to the shedding of uredospores from these pustules in quantities sufficient to form a thick almost continuous surface-coating. The lower culm-leaves were still green; their upper surface was, however, covered with a crop of uredosporic pustules, and they showed that the wilting process had commenced because the edges of the leaf-blades were already slightly inrolled. The higher culm-leaves were in much the condition of those below, except that the pustules were more sparsely scattered and the edges of the leaf-blades were not yet at all inrolled.

The limitation of the uredosporic pustules of this rust to the upper surface of the leaf-blades observed in the case of the plants first attacked was found in the course of subsequent numerous and prolonged examinations to be an almost unbroken rule. It was not at all common, though instances did occur, to find a pustule that occupied the whole thickness of the leaf, and that burst through the epidermis of both its surfaces. But to find a pustule breaking through the lower surface only was an extremely rare occurrence. In keeping with this observation also is the fact that it seems very rare with this particular "rust," and then only in very badly affected plants, to find uredosporic pustules on the outside of the leaf-sheath. Instances of this were, however, met with both at Shibpur and elsewhere, and in one or two instances pustules even appeared on and burst through the epidermis of the stem itself. Not a single instance of the occurrence of uredospores on the pales or glumes or within the flower was met with in the case of this rust. But perhaps its most noteworthy feature, so far at least as this particular outbreak at Shibpur is concerned, was the entire absence of teleutospores. In spite of prolonged and repeated systematic search for these, during the time the wheat was in the ground, they were never met with.

The samples of wheat sown at Shibpur included examples of all the "races" or "strains" of wheat usually cultivated in the province. These races are not particularly numerous, four or five being probably the limit so far as Bengal is concerned. The majority of the samples, however, belonged to four "races"; (1) a wheat with broad leaves and soft, starchy, white grain; (2) one with broad leaves and hard, glutinous, grey grain; (3) one with narrow leaves and soft, starchy, pale-red grain; (4) one with narrow leaves and hard, glutinous, darkish-red grain. The samples were not sown in any particular order as regards place of origin or as regards race. But while every patch became more or less rusted, the blight was observed to affect more seriously the soft starchy wheats, whether white or red, than it did the hard glutinous ones. A rather curious exception to this rule was noted in the case of one patch, the wheat in which, though soft, starchy and white as to its grain, had narrow leaves like a red wheat. But there is apparently no real connection between breadth of leaf-blade and power of resisting "rust," for all save one of the "soft-red" wheats had narrow blades, and almost all were badly rusted as compared with the "hard-red" wheats. The exceptions were in every case samples that ripened early, and it was apparently its agreement with those samples in this respect, and not its similarity as regards narrowness of leaf that helped to protect the "white" sample already mentioned. So far as our observations at Shibpur go, they show that there is not, at all events in Bengal, any race of wheat that is immune against this particular "rust."

The samples of wheat sown were of the usual Indian character—carelessly collected and much mixed with seeds of pulses and of other cereals. As a consequence when the crop appeared, numerous plants of barley were to be found scattered throughout the field. Our attention was at once attracted to the fact that this "rust" apparently does not affect barley. As the point is one of some importance from its bearing on the assumed identity of this Indian "rust" with the *Puccinia rubigo-vera* of Europe, a close and systematic drill to drill inspection of the whole field was instituted in connection with the search for teleutospores. In no single instance was a barley-plant at Shibpur, at any period of the season, affected by this "rust."

In most instances the mode of attack was exactly as in the plot first affected. A whole line of wheat-plants that on a given morning appeared still exempt from "rust," showed after a two-days' interval the "crown" of leaves at their bases wilted and rusted from end to end of the drill; the ground between the plants of that drill, at times

even the space between adjacent drills, became at the same time of a uniform rusty-red colour from the layer of shed uredospores that coated it.

In some instances, however, and this was more particularly the case with the glutinous wheats, the blight seemed to affect the higher culm-leaves either before or at the same time as it appeared on the lower stem-leaves and on the tuft of leaves at the base. The early portion of the period—latter half of January and first half of February—to which our observations at Shibpur refer, was marked by those morning river-fogs characteristic of the season in the Gangetic delta. On such a morning the drops of water that studded the upper surface of the leaf-blades, both of wheat and barley, had a tinge of orange imparted to them by reason of the number of uredospores held in suspension within them. The slight breeze that, as a rule, accompanies the “lifting” of such a river-fog is thus clearly sufficient to carry these spores from one plant to another, while the moisture deposited on the leaves during the fog provides a means of arresting the spores. Whether the uredospores thus arrested in these dew drops actually did affect the wheat or not, it is certain that, if they were capable of affecting either the wheat or the barley, ample opportunity was afforded them of so doing.

During the first careful conjoint survey that was made by us of this wheat-field, it was found that *Launea asplenifolia* DC.,—a common weed in Bengal, where it bears the name *tikchana*, and locally abundant about Shibpur—carried on the upper surface of its leaves in great quantities the uredospores of a *Puccinia* which seemed as if it might possibly be the one present on the wheat. In another part of the field it was found that malformed shoots of the same *Launea* bore what were apparently the æcidial fructifications of the same blight. Presently too it was discovered that the under-surface of the leaves of this *Launea* carried, in some cases, the teleutospores of obviously the same *Puccinia*.

Minute examination having shown that it is not possible by structural or metric characters to differentiate the uredospores of the *Puccinia* present on the wheat from those of the *Puccinia* present on *Launea asplenifolia*, and having thus rendered it, under the circumstances, possible that the two may be specifically identical, it became necessary to undertake experimental cultures in order to confirm or to disprove their identity. The lateness of the sowings and consequent lateness of appearance of the rust on the wheat at Shibpur and of the discovery of this *Puccinia* on *Launea asplenifolia*

rendered it impossible to carry the necessary experiments, which were initiated by one of us, to completion. As much, however, was done as it was possible, during what remained of the cold season, to do. In the meantime it was essential also to ascertain with some approach to accuracy whether the phytogeographical area occupied by this *Launea* in any way coincides with that in which wheat is grown in India. And as the evidence to be derived from specimens of the plant preserved in the Calcutta Herbarium was not conclusive, one of us was ordered by the Director of the Botanical Survey to visit certain representative wheat-growing districts and to ascertain, on the spot, the conditions there as regards the wheat, the rust, and the *Launea*. As some of the results of this investigation tended to increase rather than to diminish the difficulties that beset the whole problem, it appears better to give an account of these results *before* describing the culture experiments, although as a matter of fact the two investigations were being conducted simultaneously.

*Launea asplenifolia* DC., the species that was the object of this special search, is a member of the natural order *Compositæ*, tribe *Cichoriaceæ* & *Lactuceæ*, with an extremely slender and brittle perennial rootstock of great length as compared with the size of the plant; this rootstock can be followed almost vertically downwards to a depth of from 2 feet to 30 inches, without any sensible diminution in thickness, but we have never been able to satisfy ourselves that the whole rhizome has been obtained; on being broken the stock exudes a pure white latex, as do the leaves and stems. Towards the top the rootstock usually divides into several heads, each head being crowned with a rosulate tuft of lyrate-pinnatifid leaves 3—6 inches long. These leaves lie close to the ground in plants that grow in the open field exposed to full sunshine. When, however, the plant is growing in grassy places or amongst thick standing grain some of the internodes of the crown become, as a rule, more or less elongated; giving rise variously to a rosulate arrangement at the base followed by a slender stem with scattered leaves above this rosette; to a stem with the leaves scattered throughout; or to two or more irregular rosettes separated by distinct intervals. When growing in grain or amongst grass the leaves are delicate and thinly membranous during the cold-weather months. When growing in the open, however, the leaves are much thicker and firmer, sometimes having an almost fleshy consistence, and are, as a rule, paler green in colour. This last feature, however, is not at all universal; at times plants growing exposed to the full effects of sun and wind have a dark, purplish-red tinge imparted to the leaves, especially on the under-surface. The

plant comes into flower in February in Bengal, Behar, Central India, and Rajputana. In Oudh and the Punjab it is about a month later of flowering. It fruits in Bengal about the middle of March. For a description of its yellow flowers and its fruits, on which its identity depends, but which, its identity being established, do not interest us in this connection, reference may be made to systematic treatises. The inflorescences, however, on which these flowers and fruits are borne consist of branches that arise in the axils of from one to five of the leaves nearest the centre of the crown. The corresponding buds in the axils of those leaves that do not subtend inflorescences remain as small bodies covered with rather longish white hairs. By the middle or end of the hot weather, as a rule, all trace of the crown and its leaves has disappeared; these rhizomes that in May and June are still crowned with leaves have their leaves, even when the plant is growing in shady grassy spots, thick and fleshy as in the case of plants growing in the open sun in the cold weather.

In diseased plants the uredospores appear in rusty-red pustules that are almost always confined to the upper surface of the leaves; this is not, however, universal, for sometimes they occur on the lower surface of the leaves; occasionally they are to be found, though this is very rare, in patches that burst through the epidermis of the rachis and branches of the inflorescence. These uredosporic pustules exhibit essentially the characters exhibited by the corresponding pustules on the leaves of wheat, but as a rule they are of larger size.

The teleutospores occur perhaps most frequently on the under-surface of the leaves; it is, however, much more usual to find teleutospores on the upper surface than to find uredospores beneath. And it is not at all essential that the two be present together; in certain cases indeed it was impossible to find teleutospores on the *Launea* and *vice versa*. The presence of a teleutosporic patch is usually foreshadowed by pallid discoloration of a circumscribed area on the leaf; over this spot the epidermis very soon gives way; either generally, in which case there is a large irregular black patch of exposed teleutospores; or in a central medium-sized patch with a series of small black patches arranged round the central one in 3—5 concentric rings. Not uncommonly black teleutosporic patches are to be met with along the rachis of the inflorescence; these are always much smaller than the patches on the leaves, and sometimes the epidermis above them remains intact.

The æcidial fructifications sometimes make their appearance in what, from their position with reference to the rhizome and the other

leaves, are leaves of the normal rosette. In such a case the leaf undergoes a very rapid growth in thickness and often in length and breadth, assuming an etiolated and sickly appearance and having the indentations along its margin obscured or obliterated. Occasionally also the rachis of an inflorescence is found to be thickened in this manner and to assume the characteristic etiolated appearance that indicates the condition. But much more usually neither the leaves of the rosette nor the normally produced flower-branches are at all affected; one or more of the buds already mentioned as remaining undeveloped in the axils of the outer leaves of the rosette suddenly develop into diseased shoots, occasionally bearing malformed flowers, but much more usually having only malformed leaves. And sometimes it is found that in cases where a rhizome has several heads the others may be quite normal or at most bear only uredospores or teliospores or both, while one head is entirely malformed from the point where it rises from the ground, all its leaves and shoots being converted into æcidia-carrying organs.

Whatever the precise morphological origin of the part may be, its consistence is similar and its history is identical. A shoot of the axillary type may by the fourth day of its special growth have become 6 inches long; whatever size it may attain it does not after the fourth day appreciably increase in size. On the third day the etiolated surface shows the presence of small papillæ scattered fairly uniformly over it, these by the fifth day appear as an eruption of round military bodies of a fine purple colour which presently open at their tips and become converted into small cups filled with pale lemon-yellow æcidiospores. These æcidiospores could be seen occasionally dispersed by puffs of wind; unlike the uredospores they did not mix with water.

Sometimes the malformed shoots with æcidial fructifications remained, after the dispersal of the æcidiospores, as shrivelled very fragile structures. More usually, however, within three or four days of the ripening of the æcidia the whole shoot became soft, black and putrescent, sinking to the ground and rapidly "damping off;" the general health of the plant meanwhile remained apparently unaffected.

At Mozufferpur, selected as a representative locality for North Behar, which was visited on February 21st, the state of affairs as regards both wheat and *Launea* were very similar to those prevailing at Shibpur. The wheat was not however so badly affected by rust as in Lower Bengal: every plant was not affected and none were very severely attacked. The "rust" was here found in every case to be

confined to the upper surface of the leaf-blade. *Launea asplenifolia* was very common, and specimens were obtained in fields, in a patch of village-jungle, on the race-course, by the side of a high-road. In every locality it was affected by the *Puccinia* prevalent at Shibpur; uredospores were plentiful on the upper, teleutospores on the under surface of the leaves respectively; abnormal shoots with æcidial fructifications were everywhere very common.

A barley-field in which the individual plants seemed stunted and were far apart was examined, with some care. It was found that many of the plants were affected, though none apparently seriously so, by a "rust" that from the oval shape of its rusty patches and from the occurrence of these on the stem, the outside of the leaf-sheath and the underside of the leaf, as well as by the fact of its occurrence on barley at all, was evidently different from the rust identified by Dr. Barclay with *Puccinia rubigo-vera*. Later this same rust was discovered in an adjacent wheat-field on a wheat-plant. On being subjected to minute examination this rust was found to exhibit the structural and metric characters of the rust identified by Dr. Barclay with *Puccinia graminis*. One barley-plant was found affected by a pale lemon-coloured rust consisting of longitudinally arranged parallel lines of very small pustules containing uredospores. All that could be said regarding it was that it did not agree well with either of the other rusts.

The search for teleutospores on wheat of the blight prevalent at Shibpur was unsuccessful at Mozufferpur, and it is highly probable that no teleutospores were present. The *Launea* is here termed *titlia*; it is reputed an effective febrifuge. The name used for "Rust" is *harda*; the two rusts are not differentiated.

At Gaya, visited on 22nd February as a representative locality for South Behar, no blight of any kind was found on the wheat or on the barley. Here the wheat and barley-fields had very few weeds, none of these being perennials, and a very extended search for *Launea* was unsuccessful. At length in a gram-field, a considerable distance from any wheat, it was discovered and as usual was found to be abundant in the spot where it occurred. The plants were quite healthy; growing openly exposed to sun and wind their leaves were much thicker and firmer than in Lower Bengal at the same season, though not firmer than they become in Lower Bengal during May and June.

At Mogul Serai, North-Western Provinces, visited on 23rd February, no unequivocal example of wheat affected by Dr. Barclay's *Puccinia rubigo-vera* was met with. Nor in the barley-fields

examined were any plants unequivocally affected by Dr. Barclay's *Puccinia graminis* met with, though several good examples of the pale rust mentioned as occurring at Mozufferpur were encountered. Among the wheat plants, however, two were obtained that were unequivocally affected by the Indian rust supposed to be *Puccinia graminis*, showing in long oval pustules on the underside of the leaf. *Launea asplenifolia* was again found to be very local though quite plentiful when it occurs. Most of the plants were quite healthy; one however was manifestly affected on the upper surface of its leaves with uredospores exactly like those at Shibpur and Mozufferpur; many had teleutospores; like the Shibpur plants, usually only on the under surface, but occasionally on the upper surface as well; no æcidial fructification was met with. The *Launea* is here known as *gobi*; the rust as *gerhwi*. The name *titlia*, used at Mozufferpur for *Launea*, is here applied to a spurge, *Euphorbia dracunculoides*.

At Allahabad, which was next visited, on the afternoon of 23rd February it was found that wheat was little grown in and about the station; patches in a few compounds and along a narrow strip on the banks of the Jumna below the level reached by the river in the rains, being the only places available for search. The wheat and also the barley north of the Jumna was all quite healthy. *Launea asplenifolia* is not uncommon in gardens in the station; it was in every case quite healthy. It is here associated with another species, *Launea nudicaulis*, very like it in habit and in general appearance, but with much thicker and rather larger leaves finely serrate along their margins with minute white cartilaginous teeth, with rather larger flowers and with an ochre-coloured instead of a pure-white latex. This species also was perfectly healthy. On 24th February the area across the Jumna was examined. Here wheat was found to be this season entirely confined to the strip along the river bank mentioned above. It appeared very free from rust; only one small patch, near the upper limit of the belt, was found where about 20 plants were affected by the so-called "*Puccinia rubigo-vera*;" only uredospores were present. Associated with this patch was a single plant very considerably affected by the so-called "*Puccinia graminis*;" a second plant was found some distance off, and close to the water's edge, carrying the same rust.

Among this wheat no *Launea* was found; so soon however as the limit reached by the river in the rains was passed, *Launea nudicaulis* was found to be present and to be common. When the level ground at the top of the scarp was attained, this species gave place to *Launea asplenifolia* which was found to be plentiful. From this

point on to Naini, where the search ended, no wheat was found, and very little barley, none of the latter being diseased. *Launea asplenifolia* was quite plentiful throughout in level fields or where the slopes were gentle; on the steep sides of nullahs it was replaced by *Launea nudicaulis*. No diseased example of either species was met with. The rusts are not here differentiated; both are termed *gerhwi*: both the *Launeas* are known as *gobi*.

Jabalpur, visited on 25th February as representative of the Central Provinces, gave, like Gaya, no result. The wheat in this district was quite free from rust; the black cotton soil in which it is grown was extremely free from weeds of any kind; no *Launea* was found among the wheat. On the banks of nullahs and on the slopes of hummocks rising above the level of the black soil in the fields, also in gardens, both native and European, *Launea nudicaulis* was found, but never plentifully; no *Launea asplenifolia* was met with anywhere. The search here extended from Maharajpur on the Allahabad road (25th), to Mirganj and the Nerbadda in the opposite direction (26th February), and was everywhere equally unsuccessful. The cultivators were however thoroughly conversant with "rust;" the description given of its ravages and appearance concided very well with the appearance presented at Shibpur and at Mozufferpur. The name used for it was, however, *gerhwa* not *gerhwi*; the interest of this use of the opposite sex will be apparent in dealing with the names used in Rajputana.

On 27th February it was noted that on the sides of nullahs near Dhularia Railway Station, and in the station compound at Dharain Kundi, *Launea nudicaulis* was present; no *Launea asplenifolia* was seen. At Itarsi one wheat-field was visited; no rust was found. At Chandni neither *Launea* nor wheat were found.

On 28th February, at Khandwa, no rust was found on the wheat, and neither species of *Launea* was met with. The cultivators were quite conversant with "rust" which had, they said, been prevalent some seasons ago and which they know as *gerhwa*. Their description, however, differed very markedly from that given at Jabalpur, all who volunteered information insisting that at the last outbreak the rust was not confined to the leaves but was marked by an eruption of black specks on the glumes and pales. No barley was met with at Khandwa.

At Neemuch, visited on 29th February as representative of Malwa, the same black cotton soil that prevailed at Jabalpur and Khandwa was met with. Here also both the wheat and the barley were found perfectly free from rust. But *Launea asplenifolia*, which was not

met with at Jabalpur or Khandwa, was here, as in Bengal, local but very abundant where it occurred. The first field examined was full of the species, and nearly every plant was badly affected by the same *Puccinia* seen in Bengal and in North Behar. In this instance, however, no uredospores were found; teleutospores were very abundant and appeared to occur only in small spots arranged in concentric circles—a condition which occurred, but was not the most usual, in Bengal. Very few plants were quite healthy; of the diseased ones about 30 per cent. had æcidiosporic fructifications; these were here much less frequently borne on specially modified shoots than on distorted flowering branches; these branches much more frequently shrivelled up into brittle twigs than damped off. Continuing the search on 1st March, the local occurrence of the species was well seen from the fact that no *Launea asplenifolia* was obtained till a point was reached two miles away from the previous afternoon's patch, and three more miles had to be passed till another diseased patch was met with. As on the preceding day, the search failed to yield a specimen with uredospores and no rust was found either on wheat or barley. In one field a number of plants of *Launea nudicaulis* were found; though growing alongside of badly blighted *Launea asplenifolia* none of them were diseased. *Launea nudicaulis* was also found to occur on roadsides in the station itself. The name for both *Launeas* was again *gobi*; the name for the rust was *gerhwi* as at Allahabad, not *gerhwa* as at Jabalpur and Khandwa; the cultivators, however, use as an alternative the name *rori*, though not so commonly as the other.

The discovery of *Launea asplenifolia* diseased, on black cotton soil, leads to the suspicion, when its very local occurrence is taken into consideration, that it may only have been overlooked at Jabalpur and at Khandwa. Captain Finhey, Political Agent at Neemuch, himself an enthusiastic botanist, very kindly assisted in the search of 29th February for *Launea asplenifolia*, and on visiting Ujain ten days later most kindly searched for it there, with the result of ascertaining that at Ujain it is as plentiful, and was this year as badly diseased, as at Neemuch. It therefore certainly extends as far south as to the latitude of Jabalpur, carrying the *Puccinia* with it.

At Ajmir, on March 2nd, none of the supposed *Puccinia Rubigo-vera* was found on the wheat. At a point 5 miles from Ajmir on the Jeypore road the supposed *Puccinia graminis* was found on a wheat plant; the same rust was found on a barley-plant in a field 2 miles south of Ajmir on the Nusserabad road. No *Launea asplenifolia* was found; *Launea nudicaulis* was here more plentiful than in any of the other places visited. It is known as *gobi*, and was without any disease. The rust is here *rori* or *roli*.

At Jeypore, visited on March 3rd, the soil in the fields was a much irrigated, fine blown-sand, extremely free from weeds. No *Launea asplenifolia* was to be found anywhere in the neighbourhood of the city. *Launea nudicaulis*, very rare in fields, is not uncommon on roadsides and in gardens. It was perfectly healthy, as were the wheat and the barley. On 4th March Chaudaspura, 17 miles from Jeypore on the Tonk road, was visited, Colonel Jacob having been so good as to point out that at this point the soft blown-sand gives place to a firmer soil. Here, after a considerable search during which *Launea nudicaulis* was found to be fairly common, a spot was reached in which *Launea asplenifolia* was extremely abundant. There was very little rust on the wheat, what there was being the supposed *Puccinia rubigo-vera* of Shibpur. *Launea asplenifolia* was, however, extremely affected; most of the plants carried teleutospores only; some, however, had uredospores as well. Aecidiosporic fructifications were apparently very rare, only one being met with; the aecidia were in this case borne on a malformed leaf, not on a specially developed shoot. The most interesting discovery here was, however, a plant of *Launea nudicaulis*, the species that in every other locality had been found to be healthy, with teleutosporic fructifications on its leaves. The two *Launeas* are known indifferently as *gobi*, the "rust" on wheat is known as *rori* or *roli*. The name *rora* or *rola* was also known, but it was found impossible either to substantiate or to refute the opinion mentioned by Dr. Barclay (Journal of Botany, vol. 30, p. 47) as prevailing in some quarters, that the feminine form *roli* is used for the supposed *Puccinia graminis*, the male form *rola* for the supposed *Puccinia rubigo-vera*. It is certain that some of the cultivators use the words indiscriminately and declare that both mean the same thing. Others, however, insisted that they were different. Fortunately for them, though perhaps unfortunately for the present enquiry "rust" on the spot was hardly to be obtained. The little there was chanced to be the supposed *Puccinia rubigo-vera* which, according to the information obtained by Dr. Barclay, should have been *rola*; yet the inhabitants of the neighbourhood and the owner of the field insisted that it was *roli*.

At Rewari, March 5th, very little wheat but much barley was found; neither at all diseased. Here *Launea nudicaulis* is fairly common everywhere, and *Launea asplenifolia* as elsewhere is local but abundant where it occurs; neither *Launea* was at all diseased. From the cultivators it was ascertained that "rust" here is known under the name *rori*, but the word is not much used; the term employed is *khungi*; the *Launeas* appeared to have no name.

At Sirsa, March 6th, no rust on wheat; only one plant of *Launea nudicaulis* for which no name was obtained. "Rust" is here, the cultivators say, known only as *khungi*.

At Ferozepur, March 6th, "rust"—here known as *khungi*—was very common in patches. Though less universal than at Mozufferpur, it was much more severe in its effects. In appearance it much resembled the supposed *Puccinia rubigo-vera* of Bengal and Behar; here, however, teleutospore fructifications were plentiful, hardly a diseased plant being without some. The principal distinction between this "rust" at Ferozepur as compared with the rust met with at Shibpur, lay in the greater frequency with which the outside of the culms and of the leaf sheaths were here affected by uredospotic pustules. The teleutospores here, unlike the teleutospores on the *Launea*—from which they were subsequently found to differ extremely in size and shape—were covered by unbroken epidermis. *Launea nudicaulis* was not uncommon; *L. asplenifolia* was, in patches, plentiful. Both species were known as *pattal*, and the cultivators do not appear to distinguish between them; neither species was found to be diseased.

At Lahore, March 7th, early sown wheat was without "rust;" later sown had a good deal of the supposed *Puccinia rubigo-vera* but without teleutospores apparently; "rust" is here *khungi*. Both the species of *Launea* were found; *pattal* is a name here used only for *Launea nudicaulis*; *Launea asplenifolia* is termed either *pattal boti* or *dodak*—the last name has reference to its milky latex; the plant usually known as *dodak* is, however, the "Sow-thistle" (*Sonchus arvensis*). *Launea nudicaulis* was quite healthy; *Launea asplenifolia* was apparently healthy, but a number of plants were found with nodules developed in the axils of scales towards the top of the rootstock; these nodules were found to be filled with a mycelium.

At Gujranwala, March 8th, "rust" was plentiful, sometimes as at Ferozepur with teleutospores on nearly every affected plant; in these cases the uredospores were almost as plentiful on stems and outside of leaf-sheaths as on the leaves. In other fields, just as at Shibpur and at Mozufferpur, the uredospores appeared to be confined to the upper surface of the leaves and teleutospores were then absent. The only *Launea* present was *Launea nudicaulis*, sometimes called *dodak*, sometimes *pattal*. On its being pointed out that it has not milky juice, an informant insisted still that it was one of the *dodaks*; it is therefore possible that *Launea asplenifolia* may occur but was overlooked. This is not, however, certain; here not only the Sow-thistle, but also all the spurges are termed *dodak*.

There is not any evidence at present that *Launea asplenifolia* occurs in the Punjab west of Lahore! *Launea nudicaulis* occurs at Multan where it is known as *bhatal*; in Scinde; at Rawalpindi and at Mansenra in Hazara. But *Launea asplenifolia* recurs once more in the Kurram valley where it was collected by Dr. Aitchison; considering the peculiarly local nature of its distribution everywhere else, it is possible enough that it may occur in the Western Punjab, and may only have been hitherto overlooked. It occurs, too, in Scinde, within the past month it has for the first time been reported from near Karachi, where it is known as *bhantur*.

At Amritsar, March 9th, *Launea asplenifolia*, exceedingly local, was quite healthy. "Rust," here termed *khungi*, was very scarce; all of it the form of supposed *Puccinia rubigo-vera* with teleutospores. "Smut," termed *kanghari*, was extremely prevalent. *Launea asplenifolia* had no ascertainable name; *Launea nudicaulis* was not found.

At Gurdaspur, March 9th, "rust," *khungi*, was very scarce; *Launea asplenifolia* was not found; *L. nudicaulis*, termed *bhantal*, was rare.

At Amballa station, March 10th, *Launea nudicaulis* was seen.

At Saharanpur, March 11th, a good deal of rust, here still termed *khungi*, in local patches; mostly perfectly typical examples of the supposed *P. rubigo-vera*; one specimen was badly affected on the outer side of the leaf-sheath as well as on the leaf-blade; the "rust," in this case, was apparently quite different from any of the blights obtained elsewhere. Both *Launea asplenifolia* and *L. nudicaulis* are common; the former is, however, as usual, extremely local, the latter is general. They, like the rust, are still known by Panjabi names; *L. asplenifolia* is termed *bhantali* (feminine); *L. nudicaulis* is *bhantel* (masculine form). The spurge (*Euphorbia dracunculoides*) named *titlia* at Allahabad and Mogul Serai is here termed *dodi*. In the Herb. Saharanpur collection is a specimen of *Launea asplenifolia* collected between Jan and Pilkatra, Aligarh district, in December 1885, by Mr. J. F. Duthie, badly affected by the supposed *Puccinia rubigo-vera*; both uredospores and telentospores occur on the leaves; the æcidial fructifications are borne on specially modified shoots as in the Shibpur and Mozufferpur examples.

On the Rohilkhund and Kumaon Railway on March 14th, *Launea asplenifolia* was found in patches growing amongst kunkur "ballast" on the permanent way at the following stations: Pilibhit, Mailani, Gola Gokurnath, and Lakhimpur; at all of these

places *Launea nudicaulis* was also found. Both species were healthy everywhere except at Mailani, where *Launea asplenifolia* carried in plenty teleutosporic fructifications of the supposed *Puccinia rubigo-vera*; no uredospores and no æcidial fructifications were found. In Northern Oudh both the *Launeas* are known as *gobi*; the "rust" is *gerhwi*; in one place (Oel) the name *perhwi* was also used. At Sitapur, where wheat fields were examined, no "rust" was found, nor was either *Launea* obtained.

On this railway on March 15th, *Launea asplenifolia* was found in the permanent way at Kamalpur, Sidhauri, Ataria and Itaunja; in no case were diseased plants met with. From Itaunja onwards to Lucknow and at Lucknow itself only *Launea nudicaulis* was seen. But on the Oudh and Rohilkhund line *Launea asplenifolia* was again obtained, though not in a diseased state, at Safdarganj between Lucknow and Ajudhya, and at Malipur between Faizabad and Jaunpur.

At Meja Road on March 16th, the wheat had all been reaped; it was, however, reported to have had no rust. *Launea nudicaulis* was common everywhere. *Launea asplenifolia* was only found near Bandhwa village, but was there extremely abundant where it occurred and was much diseased; both uredospores and teleutospores were plentiful; no æcidial fructifications, however, were found.

On revisiting the wheat at Shibpur to search again—and again unsuccessfully—for teleutospores, it was discovered (March 21st) that, during the interval which had elapsed since the previous inspection (February 19th), the wheat had become affected by the supposed *Puccinia graminis*.

The initial stages of this outbreak were unfortunately not seen by us, but the condition presented by the field, when examined on March 21st, was very striking. In place of being the insignificant disease it had seemed in Upper India, attacking a plant here and there and then only to a quite trifling extent, the blight here was found to have attacked every plant in the field that had not been completely destroyed by the other "rust." Its uredospores, arranged in long oval pustules, occurred on both surfaces of every green leaf-blade, on the outside of every leaf-sheath, along the culms themselves; on the outside of the glumes and pales and even on the awns as far as their tips. A more striking contrast to the appearance of the same field when attacked by the supposed *P. rubigo-vera* than that now presented, could hardly be conceived. To render the contrast more effective, every plant of barley—which grain had remained immune from the other "rust"—was affected in precisely the way

and to precisely the extent that the wheat plants were affected. In this case too the relative immunity of the glutinous wheats against the earlier rust was of no avail; these indeed were the more severely rusted of the two classes, precisely because they had more healthy tissue left to be attacked than had the other wheats. A glance at the field in the condition it now was recalled at once the description given of an outbreak of rust some years ago at Khandwa, though it does not necessarily follow that it was *this* blight the cultivators were endeavouring to describe.

A search was at once instituted—and was continued almost daily till it became at length necessary to reap the wheat—for some local species apparently affected by this new “rust;” unfortunately up till now this search has been unsuccessful.

On closely examining the grain, however, it did not appear that this blight had done a great deal of harm. It must indeed have done some, but as it did not apparently tend to cause the leaves to wilt and wither to the extent observable with the supposed *Puccinia rubigo-vera*, the amount of harm could not fail to be less in this case than with the earlier ‘rust.’ In the case of those wheats with the leanest and most shrivelled grains, it was of course impossible to say that all the mischief had been done by the first blight; as, however, the barley, which had remained immune from the first one, ripened grain of a very fair quality though suffering so severely, to outward appearance, from the second rust, it is only reasonable to conclude that most of the mischief done to the wheat was done by the supposed *Puccinia rubigo-vera*.

The following are the principal distinctive features which characterise the various forms of rust occurring on wheat and barley that have been described above:—

#### I.—THE SHIBPUR RUST ON WHEAT.

*Uredospores*.—Sori circular or shortly oval, universally and evenly distributed over the upper surfaces of the leaves, warm yellow, pulverulent. Spores more or less circular, with elongated pedicels, and 4 to 5 germ-pores, echinulate, brilliant yellow,  $24 \times 24 \mu$ .

#### II.—THE MOZUFFERPUR RUST ON WHEAT AND BARLEY.

*Uredospores*.—Sori very large, elliptical or linear, much warmer orange than those of the Shibpur rust. Spores long oval, echinulate, orange, with 3 or 4 germ-pores situated equatorially,  $34.4 \times 17.6 \mu$ .

*Teleutospores*.—Sori of the same form as the uredosporic ones, warm brown, very soon exposed. Spores with long pedicels, which are frequently considerably dilated apically, fusiform, slightly constricted, usually greatly thickened terminally, occasionally obliquely truncate, sometimes greatly shortened and rounded,  $44.8 \times 14.7 \mu$ .

### III.—FEROZEPUR RUST ON WHEAT.

Uredosporic and Teleutospores presenting the features characteristic of *Puccinia rubigo-vera*.

One peculiarity presented itself in connection with what was apparently this form of rust as it occurred at Lahore, the uredosporic being only feebly echinulate and occurring in two distinct series. In one the spores were relatively large, measuring  $28.33 \times 25.6 \mu$ , and were of a pale yellow colour, whilst in the other they were very much smaller, measuring only  $17.6 \times 19.2 \mu$  and were of a brilliant orange hue. As there was an entire absence of any teleutospores, it was impossible definitely to determine whether, in this instance, the species were really *P. rubigo-vera* or not.

### IV.—MOGUL SERAI RUST ON BARLEY.

*Uredosporic*.—Sori narrow, oval or linear, of small size, arranged in elongated groups running parallel with the long axes of the leaves, very pale ochreous, late in becoming exposed.

Spores pyriform, with thick, moderately long pedicels, very pale yellow, echinulate, germ-pores very obscure, apparently only 1 or 2,  $24 \times 17 \mu$ .

### V.—SAHARANPUR RUST ON WHEAT.

*Uredosporic*.—Sori very large, greatly elongated. Spores more or less obovate, yellow, with from 9 to 13 germ-pores which are very conspicuous and irregularly scattered over the entire surface, measuring when mounted in Canada balsam  $23.2 \times 17 \mu$ , but no doubt considerably larger when in the fresh condition.

The rust occurring on *Launea*, and which may possibly be the source of the Shibpur rust on wheat, presented the following characters:—

*Aecidiosporic*.—Pseudoperidia wide, shallow, deeply immersed, situate most abundantly on the lower surfaces of the leaves, but also occurring on the upper surfaces and on the axes. Spores yellow, almost circular,  $20 \times 20$  to  $24 \times 24 \mu$ .

*Spermogonia* scattered over both surfaces of the leaves.

*Uredospores* echinulate, yellow, circular or shortly elliptical, germ-pores usually 3 but sometimes 4, and rarely 5 in number, irregularly scattered over the surface,  $24 \times 24$  or  $24 \times 19 \mu$ .

*Teleutospores* very short-stalked, deep brown, relatively broad, often slightly curved, the terminal cell frequently obliquely truncate,  $36 \times 27 \mu$ .

In the only experiment on artificial infection of wheat which, owing to the early onset of extreme heat, it was possible to conduct, the procedure adopted was as follows:—Samples of wheat were sown in five pots, and after they had freely germinated, the young blades were sprayed with water in which the uredospores of the *Launea* rust had been diffused in large numbers. In four instances no signs of any infection followed, probably in consequence of the extreme aridity of the air evaporating the moisture before the spores had had time to germinate. In order to avoid this source of fallacy, in the remaining case the pot was covered by a bell-glass, the interior of which had been thoroughly moistened with spray, for a period of forty-eight hours after the application of the spores to the leaves, and here infection manifested itself a week later in the form of an eruption of scattered yellow sori on a considerable number of leaves. The characters of the sori and the uredospores that they contained were precisely those of the natural rust, and, had it not been for the possibility that a certain number of uredospores derived from the wheat, may have been adherent to the *Launea* leaves which furnished the infective material, the demonstration of the genetic relation between the two diseases would have been complete.

Reviewing briefly the results of the season's observations it is apparent in the first place that several blights of the nature of European "Rust" affect wheat in India.

Of these we may most advantageously consider first the rust that was originally observed in January on the wheat at Shibpur; for convenience of reference this will be spoken of as the "Shibpur Rust." The description given of its uredospores tallies so well, in spite of slight differences, with the description of the uredospores of *Puccinia rubigo-vera* given by Winter and by Plowright that, were there no other discrepancies, it might perhaps be sufficient to deal with it as only a form of that species. There is reason to believe, moreover, that this blight may form at least part of the "rust" tentatively referred to *P. rubigo-vera* by Dr. Barclay.

That it differs specifically from *P. rubigo-vera* appears to us to be, however, highly probable. The reasons for this doubt may be stated

in detail. First; in *P. rubigo-vera* the "rust" forms teleutospores on wheat; in this "Shibpur Rust" no teleutospores are formed on the wheat. It is true that a negative proposition is difficult to prove, and it may be objected that perhaps there were some teleutospores on the wheat which were overlooked.

This may, no doubt, be the case; we do not, however, think it probable; it must be recollected too that, wherever this particular "rust" was found, the same absence of teleutospores was experienced; and it should be remembered besides that, so far as the wheat itself was concerned, teleutospores were the main object of our search.

Again, this "Shibpur Rust" apparently has a different host. The æcidial fructifications in the case of *P. rubigo-vera* are carried by a "Borage"; in the case of the present species they appear to be borne upon a "Composite." The experimental infection of healthy wheat by the *Puccinia* on this "Composite" may indeed at first appear to be definite proof that this contention is sound. It must not, however, be overlooked that one very serious source of possible error exists. The composite from which the infective spores were obtained grew in a neighbourhood where there was undoubtedly rusted wheat. The conditions for the dispersal of spores were in this neighbourhood almost ideally perfect; it is therefore always possible that the spores which were obtained from the *Launea*, and which actually did infect the wheat, were not spores of the *Puccinia* that lives upon the *Launea*, but were spores from diseased wheat that had been accidentally carried to the leaves of the *Launea* and were lying there among the spores proper to itself.

To counteract this source of error specimens of *Launea*, bearing spores, were sent to Calcutta from various places in Upper India. If the same possibility of error prevailed at Mozufferpur, it certainly did not exist at Neemuch or at Jeypore. But the heat and dryness of the season unfortunately prevented any of these check-infections from being carried out; all the spores had in each case lost their vitality during the short time required for their transmission to Calcutta. It is to be hoped that, in another season, we or other workers may prove more successful.

If the suggested, and certainly possible, connection between the "Shibpur Rust" and the *Puccinia* on *Launea asplenifolia* be ultimately made out, the necessity for distinguishing this "Shibpur Rust" from *P. rubigo-vera* will have passed beyond the region of debate. For in the first place the *Launea* in this case bears uredospores, teleutospores and æcidia at the same time, whereas the "Borages" that act as hosts for *Puccinia rubigo-vera* carry æcidial fructifications only.

This remarkable difference may possibly be held to account also for the absence, in the case of the "Shibpur Rust," of teleutospores from the wheat. As if this were not sufficient distinction, it is seen that, though the uredospores of the two are very similar, their teleutospores are quite different.

But even if the absence of teleutospores from the wheat be held not absolutely proven, and if the connection between the "Shibpur rust" and the *Puccinia* on *Launea asplenifolia* be deemed yet a matter of doubt, we still have, as we believe, proof that the "Shibpur Rust" is not *P. rubigo-vera*, in the fact that the uredospores of the two rusts occur in pustules that differ markedly in form and in disposition.

The uredosporic pustules of *P. rubigo-vera* are described by Winter (*Rabenhorst, Kryptog. Flora*; i pt. 1, p. 218) as elliptic to shortly-linear, whereas those of the "Shibpur Rust" are round. The pustules of *P. rubigo-vera* affect especially the leaf-sheaths and culms, the leaves, according to von Tubeuf (*Pflanzenkrankheiten*, 360), being much less affected, while they are figured by Oersted (*System der Pilze*, Deutsche Ausgabe, 24) as occurring on the glumes. In the Shibpur rust the disposition of the uredosporic pustules is quite the reverse of that indicated by Oersted and by von Tubeuf for *P. rubigo-vera*.

Another point to which we would direct attention is the fact that against this "Shibpur Rust" barley is immune; whereas, according to Plowright (*Brit. Uredineæ and Ustilagineæ*, r68), barley is one of the species affected by *P. rubigo-vera*. It must, however, be recollected that Winter (*loc. cit.* 218) only postulates the form described as *P. rubigo-vera* var. *simplex* Koernicke, as occurring on barley; in this he is followed by von Tubeuf (*loc. cit.* 360), and it is probable that this is Plowright's meaning also though he does not definitely express it; it will be necessary to allude to this point further on. In the meantime the life-history of this rust having been incompletely worked out, we refrain from proposing a new name to distinguish it.

We may next consider the rust that was first met with at Mozufferpur, but that was encountered in several other localities in Upper India and was found on the completion of the tour of inspection to be raging at Shibpur in March with all the violence displayed by the other rust in January and February.

That this, which for convenience we have termed the "Mozufferpur Rust," is the blight tentatively referred by Dr. Barclay to *P. graminis*, is undoubted. The true *P. graminis* is a species whose æcidial

fructifications are borne by one or more species of Barberry. In this case, however, the structural and metric features differ rather more markedly from those of true *P. graminis* than those of the Shibpur Rust do from the corresponding characters of *P. rubigo-vera*. The uredospores are decidedly narrower in the "Mozufferpur Rust" and, in place of having but two germ-pores, have an equatorial belt of germ-pores; the teleutospores are not, however, distinguishable except in forming pustules of a warm-brown colour, instead of black as in *P. graminis*. The most distinctive feature is again in the disposition of the pustules, which exactly as was the case with the Shibpur Rust and *P. rubigo-vera*, here reverse the conditions met with in *P. graminis*. In *P. graminis* the pustules are largely developed on the leaves; in the "Mozufferpur Rust" the pustules are confined almost entirely to the leaf-sheaths, culms and glumes. And while it is true that no plant has yet been found to carry the æcidia of this "Mozufferpur Rust," it is easier, and much more probable, to suppose that such a plant exists but has, so far, been overlooked, than to postulate that its spores are wind-borne to the wheat of the Indian plains from the Himalayas or the highlands of Central India, where alone "Barberries" are to be found. There is another strong reason for concluding that this "Mozufferpur Rust" cannot well be ordinary *P. graminis*; *P. graminis* is in Europe injurious to wheat, to rye, and especially to oats, less to barley (von Tubeuf, *Pflanzenkrankheiten*, 358). There were but few plants of oats present in the farm at Shibpur; none of these carried any rust. But this "Mozufferpur Rust" affected both wheat and barley to precisely the same extent, in exactly the same way and, apparently, with equal severity; whereas apparently only one particular form of *P. graminis* (forma *secalis*) has been found on barley (Eriksson und Henning, *Zeitschr. für Pflanzenkrankh.*, 1894, ii); this form occurs also on rye, whence the name, and on "Couch-grass," but has not been found on wheat at all.

The "Mozufferpur Rust," even in the very severe attack witnessed at Shibpur, did not appear to us to injure the plants to an extent at all corresponding to the amount of rust they carried; the grain whether of wheat or of barley did not seem to be greatly depreciated by its presence. It is difficult to compare this feature with the corresponding character of *P. graminis*; Plowright (*loc. cit.* 168) indicates that *P. graminis* is the more severe of the two leading wheat-rusts in England, whereas the experience on the continent of Europe appears to have been the reverse.

More difficult to deal with than either of the preceding blights is

undoubtedly that met with for the first time at Ferozepore and met with again at Gujranwala and at Amritsar, in which there were teleutospores as well as uredospores on the wheat.

The disposition of the uredosporic pustules in this blight was much the same as in the case of the Mozufferpur Rust, the outside of the leaf-sheaths and the outside of the culms being much more affected than the leaf-blades. But the uredospores themselves in this case differ altogether from those of the "Mozufferpur Rust," and the teleutospores, while differing as much as the uredospores do in structure, deviate still further, in that the teleutosporic pustules do not rupture the epidermis of the leaf or stem on which they occur, as those of the "Mozufferpur Rust" do. On the other hand this "Ferozepur Rust" has uredospores extremely like—indeed not distinguishable by tangible characters from—those of the "Shibpur Rust," and of the *Puccinia* as *Launea asplenifolia*. Still it does not follow that this "Ferozepur Rust" is the same as the "Shibpur Rust;" indeed the presumption is quite the reverse, since in this case we have a rust with teleutospores on wheat, in the "Shibpur Rust" one without teleutospores on the wheat. And it is certainly not the same *Puccinia* as is found on *Launea asplenifolia* for the teleutospores of the two are 'tally unlike. We must therefore have in this "Ferozepur Rust" either a very distinct manifestation of the 'Shibpur Rust,' and at the same time find in it a proof that the *Puccinia* on *Launea asplenifolia* is in no way connected with "rust" on wheat; or what, so far as the evidence at present available goes, is more probable, find in it a third "rust" on Indian wheat.

The structural and metric characters of the "Ferozepur Rust" agree so exactly with those credited to *P. rubigo-vera* by Oersted, Winter and Plowright, and the disposition of its pustules, except that none were found on the glumes, is so like the disposition of the pustules in *P. rubigo-vera* that we should have very little hesitation in identifying it with European species, but for the difficulty as to its æcidial fructification. No "Borages" have yet been discovered in India—though these have been long and diligently looked for by many competent observers—to carry any *Puccinia* whatever. And if this is at best but negative evidence, it still affords, in our opinion, an excellent reason for retaining an open mind regarding the point. It should be here observed that the "rust" obtained at Lahore, though teleutospores were not found, had its pustules disposed in the same manner as those of the "Ferozepur Rust" and not as in the "Shibpur Rust." As only the late sown wheat was rusted at Lahore, the absence of teleutospores may simply have been due to

their not having yet been formed. Still as has been noted already, the pustules present were very peculiar in containing spores of two quite different sizes.

There is unfortunately as yet no collateral evidence available regarding the relationship of this "Ferozepur Rust" to barley or to other grasses. And there is not as yet any means of judging whether this "Ferozepur Rust," or the "Shibpur Rust" with similar uredospores, is the more destructive to the wheat crop.

It has been already recorded that on one plant of barley at Mozufferpur in North Behar, and again on many plants of barley at Mogul Serai in the North-Western Provinces, a rust was found, the leading features of which were that the very small lemon-yellow uredosporic pustules lay arranged in many parallel longitudinal rows on the leaf-blades. This rust was only met with on these two occasions; because it happened to be more plentiful at that place, we have termed it the "Mogul Serai Rust." No teleutospores were found. The rust appeared to do no tangible harm even at Mozufferpur, where the conditions had evidently not been unfavourable to the development of at least the "Shibpur Rust." It does not, however, follow that under all circumstances this need remain equally harmless, and though it has not as yet been met with on wheat, it is nevertheless a "rust" that must be reckoned with in any subsequent enquiry.

Regarding its possible identity little can be said. It certainly appears to us impossible to refer it either to the Shibpur blight or to the Mozufferpur one, still less to the Ferozepur blight. Future workers may find it advisable to compare it with a little understood European *Puccinia*, also like this one apparently confined to barley, of which the æcidial fructification and the intermediate host are equally unknown. The rust in question is one that was differentiated by Fueckel (*Symbol. Nachtr.* ii. 16) as *Puccinia Hordei* and by Rostrock (*Herb. Mycet. Oeconom.* n. 451) as *P. anomala*, but was afterwards supposed by Koernicke (*Land- und Forstw. Zeitung*, 1865, n. 50) to be only a variety (var. *simplex*) of *P. rubigo-vera*. Winter agrees (*loc. cit.*) with Koernicke; Plowright (*loc. cit.*) apparently does the same. Eriksson and Henning (*loc. cit.*) have returned to Fueckel's view, and treat it as a distinct species. Von Tubeuf, with a fine impartiality, adopts both views and enumerates the rust twice. But it will be apparent from this divergence of view that even this European *Puccinia* is hardly completely understood.

Finally the very distinct rust met with only at Saharanpur and only on one plant has to be referred to. This "Saharanpur Rust" differed markedly from all the other specimens obtained, in the dis-

position of its pustules. In place of being circumscribed areas these consisted of linear streaks, sometimes several inches in length, along the culms and along the outside of the leaf-sheaths. Whether this rust affects the glumes cannot be said, for it was only found on one plant, and as it happened that plant had every head destroyed by *ustilago*. The plant, strange to say, was apparently quite vigorous; this, coupled with the general appearance of the rusted spots, led to the belief at the moment of gathering, that it was but an extreme example of the "Mozufferpur Rust" in which the pustules had become confluent. But when minutely examined it was found that it has nothing whatever to do with the "Mozufferpur Rust;" it differs entirely as regards uredospores and has no teleutospores. The uredospores are also extremely different both from those of the "Shibpur Rust" and of those the "Ferozepur Rust." From the latter it differs moreover in having no teleutospores at all; from both it differs in having uredospores with an unusually large number of germ-pores. Whether it be capable of affecting barley is as yet unknown. It is, however, clear that there is a fifth rust—the fourth occurring on wheat in the plains of India—the life-history of which requires further investigation before the subject of rust on wheat in India is fully understood.

Any consideration of the question of the relationship of the geographical distribution of *Launea asplenifolia* to the wheat-growing area is almost premature, in view of the fact that the connection between the *Puccinia* which this *Launea* carries and one of the rusts on wheat, has not been definitely demonstrated.

It is well known, for example, that in years when rust attacks wheat in the Central Provinces, its ravages are excessive. Yet in the Central Provinces no examples of *Launea asplenifolia* were obtained. Too much stress should not be laid upon this point for several reasons. It is, to begin with, a matter capable of experimental demonstration whether this connection exists or not. If it be proved that it does exist, the observations made during the present season need not give rise to any great difficulty. There is no reason why a rust, under suitable conditions may not, after having once started from a focus of infection in the shape of a diseased *Launea* patch, travel by direct infection in a very brief period from one end of a province to another. But it does not follow because it was not found in the Central Provinces that *Launea asplenifolia* does not occur there. It is a species that, though always plentiful where it occurs, has an exceedingly "local" distribution, and it is conceivable that it may exist and yet have been overlooked. Again though

*Launea asplenifolia* was not found, another species of *Launea* was ascertained to be general in the Central Provinces; this species was in Rajputana discovered to be capable of carrying at least one stage of this blight. Then it is now known that *Launea asplenifolia* occurs at Ujain, which means that, further to the west, it occurs as far south as, and in precisely the soil it would find at, Jabalpur. And, besides, it does not follow that the blight most destructive in one place or in a given season is that most destructive elsewhere or in another season. The cultivators questioned regarding the probable cause of the "rusting" at Mozuffarpur, insisted that the meteorological conditions of the past cold-season never failed to induce it. At Gaya, on the other hand, the belief was that conditions such as were experienced last cold-weather are precisely those that ensure exemption from the blight. One possible explanation of this discrepancy is doubtless that the blights which the cultivators had in their minds may be different ones. But this is certainly not the only explanation, and in no case is it quite a sufficient one. Fortunately for the cultivator, but unfortunately for our enquiry, there was practically no rust this year outside Bengal and North Behar. But even during the journey described above, it was possible this year to discover that different blights may on occasions lead to practical destruction of the wheat crop. At Maharajpur near Jabalpur a cultivator described with all the accuracy born of familiar and sad experience the wilting and inrolling of the tuft of leaves at the base of the young wheat plant, the rusty spotting of the leaves above, the reddening of the ground and the shrivelling of the grain characteristic of the Shibpur blight. "It ate up the fields like fire" was the striking phrase with which he concluded his narrative of the last rust epidemic in Central India.

At Khandwa, on the other hand, the wheat being there also this year equally free from rust, the cultivators described the onset and progress of their last epidemic in altogether different terms, and though the force of the account was not at the time appreciated, the moment the wheat-field at Shibpur, when under the full influence of the "Mozufferpur Rust," was seen, it was realized that the Khandwa account may have been as graphic and probably as accurate as the account obtained at Jabalpur, since here too was a prevalent blight with general features quite as striking as, and yet totally unlike, those of the earlier one. It did not, however, follow that what had been described at Khandwa was this particular rust. On the contrary the fact that this—the Mozufferpur Rust—does not apparently, even in bad cases, very seriously affect the health of the plant, whereas the blight described by the cultivators at Khandwa was said to have

completely ruined their crop, leads rather to the conclusion that the Khandwa rust must have been different from the Mozufferpur one ; it may possibly have been the " Ferozepur Rust " which, as we have indicated, closely resembles true *P. rubigo-vera* if it be not actually that species. In true *P. rubigo-vera* the glumes are covered with pustules, precisely as the Khandwa cultivators described ; it is true that no pustules were found on the glumes in the Punjab this season ; it must, however, be recollected that rust in the Panjab was this year almost everywhere scarce and hardly anywhere severe.

Even if it be ultimately possible to definitely associate the *Puccinia* on *Launea asplenifolia* with one of the rusts on Indian wheat, and even if that rust should prove to be the most destructive of all the rusts that occur on wheat in the plains of India, it is somewhat difficult to suggest any remedial measure. There is, of course, but one that could be of any real benefit—the extirpation of *Launea asplenifolia*. But it will, we think, be plain, from the account we have given of its structure and of its distribution, that this must prove practically an impossible undertaking.

Even if *Launea asplenifolia* were eradicated, the source of but one blight would be removed ; and in the meantime it is necessary to wait for verification or the reverse of the connection mentioned as possible in the case of the Shibpur blight, and for further knowledge regarding the other rusts before active measures are advocated.

# A NOTE

## ON

### THE BOTANY OF THE BALUCH-AFGHAN BOUNDARY COMMISSION, 1896.

*By F. P. MAYNARD and D. PRAIN.*

HAVING been directed to join, as medical officer to the party, the Baluch-Afghan Boundary Commission which was occupied from 27th January till 29th May 1896 in demarcating the frontier between Baluchistan and Afghanistan, Surgeon-Captain Maynard, I. M. S., before leaving Calcutta, obtained a supply of drying paper from the Herbarium of the Royal Botanic Garden. On Dr. Maynard's return he made over to the Herbarium the specimens collected; the species were there determined by Dr. Prain. The present note has been prepared jointly from Dr. Maynard's field notes and from the determinations effected in the Herbarium, Calcutta; it should, however, be understood, with reference to the opinions expressed as to the identity of certain species, that Dr. Prain accepts all responsibility for the identifications, and for any deductions to which these may lead. For the map that accompanies the note, on the other hand, Dr. Maynard accepts all responsibility.

From Gulistan, where the Commission left the railway, on to Shorawuk, the country resembles the district to the south-west of Quetta described by Stocks in Hooker's *Journal of Botany*, Vol. II, pp. 303—308 (1850). A very full account of the vegetation of the neighbouring district of Quetta itself is given by Mr. Lace in the *Journal of the Linnean Society*, Vol. XXVIII, pp. 288—312 (1891).

The Shorawuk plain, immediately to the north of Nushki, is Afghan territory. it is quite fertile and fairly well populated, the inhabitants occupying permanent villages. The people cultivate by irrigation, the water for the purpose being obtained from the Lora river, which ends in this plain. Wheat and barley, especially the latter, form the staple crops.

The similar plain of Nushki, to the south of Shorawuk, which was only skirted on the outward journey, but which was traversed

by the Commission on its return march, belongs to Baluchistan. The country from Nushki onwards to Robat is not absolutely barren: about Lijji-Karez, where there is a stream, and round Chageh, where there are wells, there is indeed a fair amount of vegetation. No cultivation was seen at either place though there is said to be a little cultivation round Chageh fort.

At Robat itself, which is situated near the Koh Malik-Dokhand and is about midway between Quetta and the Persian frontier there is a small stream; here the main camp of the Commission remained for two months. There is said to be some cultivation at this point, but none was seen.

There is another Robat (the name means simply "outpost") at the foot of the Koh-i-Malik Siah where the two countries meet Persia; here there is a little cultivation of wheat and barley. Between the two Robats, a distance of 270 miles, water—nearly always saline—was only obtained in seven places. The country traversed was a desert composed of alternating sand hills and gravel-plains with hardly a trace of vegetation. The line of march skirted the bases of successive mountain ranges running up to 5,000 feet, as barren and desolate as the desert itself, of which they form the southern boundary. The general elevation of the line of march was about 3,000 feet.

The water-supply consisted of springs or wells situated a few miles off the line of march up gorges in these mountains,—the desert itself being waterless except for the large salt lake known as the Gaud-i-Zirreh and a smaller salt lake in the bed of the Shelag river at Godir-i-Shah. The Gaud-i-Zirreh is an overflow of the Helmund rendered salt by continued evaporation; the last flood sufficient to cause an overflow occurred in 1884, but the lake is still of considerable size.

During the first part of the Mission in February while among the mountains of the Khwaja Amran and Sarlat ranges, the cold was intense, the minimum thermometer indicating  $15\ 5^{\circ}$  Fahr. below freezing point—the soda water carried by the Mission being frozen; snow and hail fell frequently. In April and May the heat was just as intense as the cold had previously been. The maximum shade temperature reached  $115^{\circ}$  Fahr., and the solar radiation thermometer frequently reached  $205^{\circ}$  Fahr., the highest temperature the instrument was capable of recording. Violent dust- or sand-storms occurred almost daily. The dryness of the atmosphere was great, the difference between the dry- and wet-bulb thermometers varying from  $30^{\circ}$  up to  $40^{\circ}$ .

For the last two years there had been no rain ; this year in February and March rain fell, and it was owing to this fact that the Commission was able to stay so long as it did, the rain having delayed the advent of the hottest weather. Usually the fierce hot winds commence blowing from the west early in April, but this year they were only beginning when the Commission started back, in the middle of May, from the Robat where its main camp had been stationed for the two previous months. The inhabitants, where there were any, spoke of the heat with awe and said these hot winds shrivelled everything up and kept the people imprisoned in their tamarisk huts from morning till evening. The slight experience the Commission had was quite enough to make its members believe all the inhabitants said.

In consequence of the excessive heat the Mission had to march, for the greater part of the period it was away, during the night. But for this the collection obtained might have been considerably increased. While, however, it is admittedly far from complete, there is no reason to doubt that it is fairly representative of the flora of the country traversed. All the specimens come from a region lying between latitude  $29^{\circ}$  and  $30^{\circ}$  north ; the longitudes of the different localities with their altitudes are given in the systematic list. The specimens obtained on a hill, 600 feet high, lying eight miles west of Gazechah, were brought in by Lieutenant Webb-Ware ; the others were, with one or two exceptions, collected by Surgeon-Captain Maynard.

The collection, small as it is, has proved one of very great interest : with hardly an exception, Dr. Maynard's specimens belong to species previously most inadequately represented in the Calcutta Herbarium. In preparing the list the primary references given for the species are those in M. Boissier's *Flora Orientalis*, the only work which deals systematically with the vegetation of the area ; those in the *Flora of British India*, where the species happens to be included in that work, have been added for purposes of comparison.

The flora of the region is purely that of the 'Oriental' region, for, of the 43 flowering plants recorded in the list, it will be seen that seventeen or nearly 40 per cent. are not accounted for in the *Flora of British India* at all and are therefore plants that presumably do not occur within British territory ; of the remainder, only seven, or a little over 16 per cent., extend to the east of Scinde, Rajputana, and the Western Panjab—districts that, from a phytogeographical point of view, form but a province of the 'Oriental' region.

Perhaps the most striking feature of the list is that it includes no fewer than twelve species of flowering plants which are not to be

found in the list of plants from British Baluchistan, drawn up by Messrs. Lace and Hemsley in their very interesting and exhaustive sketch of the vegetation of that region in the *Journal of the Linnean Society*, Vol. XXVIII, pp. 313—321.

These species are as follows :—

*Tamarix macrocarpa.*  
*Reaumuria Stocksii.*  
*Monsonia senegalensis.*  
*Trachydium Kotschyi.*  
*Ferula Assa-fetida.*  
*Phagnalon acuminatum.*  
*Senecio Decaisnei.*  
*Statice macrorhabdos.*  
*Hyoscyamus muticus.*  
*Mentha arvensis.*  
*Rheum Ribes.*  
*Gagea amblyopetala.*

We might add to the list also *Rhagadiolus Hedypnois*, but for the fact that our material of the plant so identified is insufficient for absolute determination.

That so large a proportion as 28 per cent. of the species reported should differ from those obtained in the Quetta district indicates that, in spite of the general similarity of the vegetation throughout Baluchistan, there are still some marked local differences. It may be assumed, too, that the figures given are not likely to overstate the proportion, for while it is true that the present list must be very far from complete for the area to which it refers, that given by Messrs. Lace and Hemsley is probably almost exhaustive, since the formation of the collection on which it is based extended over several seasons.

And that the alteration is gradual may be gathered from the fact that at least four of the twelve species now enumerated as absent from the Quetta district were obtained by Stocks in the country immediately to the south-west of Quetta.

*List of the plants collected during the Baluch-Afghan Boundary Commission.*

CRUCIFERÆ.

1. MALCOLMIA BUNGEI Boiss. *Fl. Orient.*, i., 226.

Plain 20 miles north of Nushki, 3,000 feet ; Lon. 66° E., *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

2. *MALCOLMIA STRIGOSA* Boiss. *Fl. Orient.*, i, 224; *Fl. Brit. Ind.*, i, 146.

Shorawuk plain, among wheat, 3,000 feet; Lon.  $66^{\circ}$  E., *Maynard*.

3. *PHYSORHYNCHUS BRAHUICUS* Hook. *Fl. Orient.*, i, 403; *Fl. Brit. Ind.*, i, 165.

Saindak, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

### TAMARISCINEÆ.

4. *TAMARIX PALLASII* Desv. *Fl. Orient.*, i, 773. *T. gallica* var. *Pallassi* of *Fl. Brit. Ind.*, i, 248.

Between Lijji-Karez and Chageh, 2,400 feet; Lon.  $64^{\circ}40'$  E., *Maynard*.

This is what stands, at least in part, as *T. gallica* proper in Messrs. Lace and Hemsley's list of Baluchistan plants.

5. *TAMARIX MACROCARPA* Bunge. *Fl. Orient.*, i, 779.

Sarlat range on hill-sides at junction of Shista and Lora rivers, 4,000 feet;  $66^{\circ}10'$  E., *Maynard*. Gargarok, 4,500 feet; Lon.  $64^{\circ}15'$  E., *Maynard*.

A shrub with bright red bark, much galled by insects. This was obtained also by Dr. Aitchison during the Afghan Delimitation Commission of 1884-85.

6. *REAUMURIA STOCKSII* Boiss. *Fl. Orient.*, i, 761.

Saindak, on fossil-beds, 3,000 feet; Lon.  $69^{\circ}40'$  E., *Maynard*.

Petals pinky-purple, anthers red.

### GERANIACEÆ.

7. *MONSONIA SENEGALENSIS* Guill. & Perr. *Fl. Orient.*, i, 808; *Fl. Brit. Ind.*, i, 427.

Saindak, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

### RUTACEÆ

8. *PEGANUM HARMALA* Linn. *Fl. Orient.*, i, 917; *Fl. Brit. Ind.*, i, 486.

Soru, 4,500 feet; Lon.  $63^{\circ}30'$  E., *Maynard*.

A poisonous shrub which camels refuse to eat.

### ANACARDIACEÆ.

9. *PISTACIA CABULICA* Stocks. *Fl. Orient.*, ii, 7.

Between Goari Nullah and Bara Khan Karez; Lon.  $66^{\circ}10'$  E.; leaves galled, *Maynard*. Gargarok, 4,500 feet; Lon.  $64^{\circ}45'$  E., *Maynard*.

This tree was found by Dr. Maynard growing in clefts of limestone rock above the level of the tamarisk (*Tamarix macrocarpa*) that filled the bottom of the valley. In this place therefore the species affects a position corresponding to that affected (see Lace and Hemsley) by *Pistacia Khinjak* in the Quetta district. Dr. Maynard's tree is, however, undoubtedly *P. cabulica*, which Messrs. Lace and Hemsley treat as only a variety of *P. mutica*. Dr. Aitchison goes still further, since he will not admit that even *P. Khinjak* can be separated from *P. mutica*, and further believes that, when so united, *P. mutica*, *Khinjak* and *cabulica* only form a variety of *P. Terebinthus*. A careful examination of the material in the Calcutta Herbarium prevents the writer from adopting Aitchison's conclusion and leads him, with Stocks and Boissier, to treat *P. cabulica* as a distinct—it certainly is a very easily distinguishable—plant.

#### LEGUMINOSÆ.

10. ASTRAGALUS SQUARROSUS Bunge. *Fl. Orient.*, ii, 487.

Saindak, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

The specimens exactly agree with Griffith's n. 1541 [K. D.] and with Stocks' n. 761. This species forms, at all events in part, the *A. hyrcanus* of Messrs. Lace and Hemsley's list. Though it superficially closely resembles *A. hyrcanus* it is in reality very distinct from Pallas' plant.

#### UMBELLIFERÆ.

11. TRACHYDIUM KOTSCHYI Boiss. *Fl. Orient.*, ii, 929.

Near Robat, 5,000 feet; Lon.  $63^{\circ}40'$  E., *Maynard*. Near Saindak, 3,000 feet, in an almost dry stony river-bed; Lon.  $61^{\circ}40'$  E., *Maynard*.

Flowers pale greenish-yellow, smelling exactly like parsley.

12. FERULA ASSA-FŒTIDA Linn. *Fl. Orient.*, ii, 994.

Hills between Samuli and Robat, 5,000 feet; Lon.  $63^{\circ}50'$  E., *Maynard*.

The true *Assa-fœtida* or at all events one of the species from which *Assa-fœtida* is collected; seen again at Amir Chah, Lon.  $62^{\circ}35'$  E., and at Saindak, Lon.  $61^{\circ}40'$  E. The plant affects bare rocky hill-sides and in trying to dig out an entire rhizome, holes several feet deep were frequently made; an entire root-stock was, however, never obtained.

This is the plant, or at least one of the plants, that people from Kandahar yearly visit the Koh-i-Sultan to collect.

Captain McMahon, who has often watched the collection of *Assa-fœtida* in other parts of the North-Western Frontier, thus describes the process: When the heads are 2 or 3 feet high they are cut down to within one to two inches from the ground. The cut ends are then covered with a little dry earth in order, the collectors say, to keep the wind off. After twenty hours the people collect what has exuded; the stock is then cut down another eighth of an inch. Captain McMahon has not noticed whether the operations are performed at any particular hour of the day.

The milk is not allowed to dry in the sun; to obviate this the *Assa-fœtida* collectors build small stone traps, open at one side, over each plant in order to keep off the sun's rays. The juice when partly dried is mixed with some kind of earth like Fuller's earth; this is merely to increase the weight and not with any idea of improving the drug. Doubtless the precautions taken to prevent drying are mainly with a view to facilitate this subsequent adulteration.

The collection is usually carried on about June and July chiefly by Kakars—and among these by the tribe of Hari Pal, and by Babars, who travel to the likely places from Kandahar.

This year there were no signs of any arrivals up to the middle of May, when the Commission left the region. This was partly because there had been no rain during the two or three previous seasons, but partly also—so the guides informed the party—because a rumour had got abroad that a British force was expected this year, the Commission being magnified into an army corps.

On the hills round Amir Chah many of the small traps mentioned above were met with. They were not the domed structures formed of twigs and covered with clay that have been described by Aitchison (*Trans. Bot. Soc. Edin.*, xviii, 70), but were made of stones. Small flat stones were propped against each other so as to form triangular or quadrilateral chambers, open at one end, usually the north, roofed over with another flat stone and measuring from 6 to 12 inches in height by about as much across the mouth.

#### COMPOSITÆ.

13. PHAGNALON ACUMINATUM Boiss. *Fl. Orient.*, iii, 222.

Wuchdara river, among rocks. 5,000 feet; Lon. 66°25' E.,  
*Maynard*

Mr. Lacey reports *P. nivium* from British Baluchistan, but not this species.

14. *PULICARIA GLAUDESCENS* Jaub. & Spach. *Fl. Orient.*, iii, 209; *Fl. Brit. Ind.*, iii, 300.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

15. *ANTHEMIS ODONTOSTEPHANA* Boiss. *Fl. Orient.*, iii, 319; *Fl. Brit. Ind.*, iii, 312.

Hill 8 miles west of Gazechah 6,000 feet; Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

16. *ARTEMISIA MARITIMA* Linn. *Fl. Orient.*, iii, 366; *Fl. Brit. Ind.*, iii, 323.

Spintijha, 6,000 feet, and elsewhere all over the hill-sides; *Maynard*.

This species was met with in greatest quantity in the region between Lon.  $66^{\circ}50'$  E. and Lon.  $65^{\circ}$  E. The plant smells strongly of sage; yields a much-esteemed oil; affords excellent fuel; and is one of the best and most valuable camel-fodders.

17. *SENECIO CORONOPIFOLIUS* Desf. *Fl. Orient.*, iii, 390; *Fl. Brit. Ind.*, iii, 341.

Plain 20 miles north of Nushki, 3,000 feet; Lon.  $66^{\circ}$  E., *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}15'$  E., *Webb-Ware*.

18. *SENECIO DECAISNEI* DC. *Fl. Orient.*, iii, 386.

Hill 8 miles west of Gazechah, 6,000 feet. Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

19. *RHAGADIOLUS HEDYPNOIS* Fisch. & Mey. (?) *Fl. Orient.*, iii, 723; *Fl. Brit. Ind.*, iii, 392.

Saindak, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

A seedling plant without flower appears to belong to this species but the material is insufficient for definite determination.

#### PLUMBAGINEÆ.

20. *STATICE CABULICA* Boiss. *Fl. Orient.*, iv, 871; *Fl. Brit. Ind.*, iii, 480.

Head of Shista river, 6,500 feet; Lon.  $66^{\circ}25'$  E., *Maynard*. Sarlat range, on hill-sides at junction of Shista and Lora rivers, 4,000 feet; Lon.  $66^{\circ}30'$  E., *Maynard*.

21. *STATICE MACRORHABDOS* Boiss. *Fl. Orient.*, iv, 869; *Fl. Brit. Ind.*, iii, 480.

Sarlat range, in stream-beds at junction of Shista and Lora rivers, 4,000 feet; Lon.  $66^{\circ}30'$  E., *Maynard*.

This species is apparently confined to stream-beds; it never occurs on hill-sides like *S. cabulica* and is later of flowering than that species.

### APOCYNÆ.

22. *RHAZYA STRICTA* Dcne. *Fl. Orient.*, iv, 46; *Fl. Brit. Ind.*, iii, 640.

Western slope of the Sarlat range, 3,500 feet; Lon.  $65^{\circ}59'$  E., *Capt. H. F. Walters*.

A deadly poison which, however, the camels know to avoid. The Oleander (*Nerium odorum*), a member of the same natural family, was seen occasionally during the early marches, but was not collected. The Oleander is an equally deadly poison and possesses the disadvantage that camels can never be taught to avoid it, though donkeys can.

### BORAGINÆ.

23. *HELIOTROPIMUM EICHWALDI* Steud. *Fl. Orient.*, iv, 131; *Fl. Brit. Ind.*, iv, 148.

Saindak, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

### SOLANACEÆ.

24. *LYCIUM BARBARUM* Linn. *Fl. Orient.*, iv, 289; *Fl. Brit. Ind.*, iv, 241.

Gargarok, 4,500 feet; Lon.  $64^{\circ}15'$  E., *Maynard*.

25. *HYOSCYAMUS MUTICUS* Linn. *Fl. Orient.*, iv, 293; *Fl. Brit. Ind.*, iv, 245.

Kacha; edges of streams at 3,300 feet; Lon.  $61^{\circ}20'$  E.; "corolla lavender with claret-colored markings," *Maynard*.

This species was not obtained by Aitchison during the Afghan Delimitation Commission of 1884-85, nor has it been collected in Eastern Baluchistan by Lace. In the area examined by Lace, *H. reticulatus* occupies similar situations and appears to be the representative of this species.

### OROBANCHEÆ.

26. *CISTANCHE TUBULOSA* Wight. *Fl. Brit. Ind.*, iv, 324. *Phelipæa tubulosa* Boiss. *Fl. Orient.*, iv, 500.

Between Chandan Band and Ziarat Syed Mohmund, 3,000 feet; Lon.  $65^{\circ}30'$  E., *Maynard*. Desert near Gazechah, 2,500 feet; Lon.  $64^{\circ}50'$  E., *Maynard*.

Only about six inches of the flowering portion of the stem of this plant appears aboveground; the underground part is sometimes 2 or 3 feet in length. The flowers are sweet-scented, the older flowers purple, the younger yellow. The plant on which it is parasitic was not ascertained. Lace finds that on the plains, at Sibi this is

parasitic on *Saivadora oleoides* and that there the flowers are golden-yellow.

#### LABIATÆ.

27. *MENTHA ARVENSIS* Linn. *Fl. Orient.*, iv, 544; *Fl. Brit. Ind.*, iv, 648.

Lijji-Karez, 2,400 feet, along the stream; Lon.  $64^{\circ}50'$  E., *Maynard*. In gorge at Gargarok, 4,500 feet; Lon.  $64^{\circ}15'$  E., *Maynard*.

*Mentha sylvestris*, which might well have been expected to occur, was not once met with throughout the Mission; on the other hand, the present species apparently was never met with by Mr. Lace in Eastern Baluchistan.

28. *SALVIA MACROSIPHON* Boiss., var. *KOTSCHYI*, Boiss. *Fl. Orient.*, iv, 615.

Gargarok, 4,500 feet; Lon.  $64^{\circ}15'$  E., *Maynard*.

The specimen agrees exactly with Stocks n. 709 which is identified as above by M. Boissier himself. The same plant, it should be added, is issued by Messrs. Hemsley and Lace as identical with *S. Sclarea* Linn; this the writer can hardly bring himself to admit.

#### ILLECEBRACEÆ.

29. *COMETES SURATTENSIS* Linn. *Fl. Orient.*, i, 753; *Fl. Brit. Ind.*, iv, 712.

Saindak, on fossil mounds, 3,000 feet; Lon.  $61^{\circ}40'$  E., *Maynard*.

30. *GYMNOCARPOS DECANDRUM* Forsk. *G. fruticosum* Pers. *Fl. Orient.*, i, 748.

Desert near Gazechah, 2,500 feet; Lon.  $64^{\circ}50'$  E., *Maynard*.

Used as a camel-fodder.

#### AMARANTACEÆ.

31. *AERUA JAVANICA* Juss. *Fl. Orient.*, iv; *Fl. Brit. Ind.*, iv, 727.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

#### CHENOPODIACEÆ.

32. *CHENOLEA ERIOPHORA* Aitch. & Hemsl. *Kochia latifolia* Fresen. *Fl. Orient.*, iv, 927.

Desert near Gazechah, 2,500 feet; Lon.  $64^{\circ}50'$ , *Maynard*.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}50'$ , *Webb-Ware*.

Covered with fine wool, white on surface, beautifully tinted with lake underneath. The wool becomes greyish-brown when the plant is dried.

## POLYGONACEÆ.

33. *CALLIGONUM* sp. = Griffith, *Journal* n. 95.

Desert near Gazechah, 2,500 feet; Lon.  $64^{\circ}50'$  E., Maynard.

Hill 8 miles west of Gazechah, 6,000 feet: Lon.  $64^{\circ}50'$  E., Webb-Ware. Amir Chah, 3,300 feet; Lon.  $62^{\circ}35'$  E., Maynard.

The specimens of all three gatherings belong obviously to one species. Only one gathering, however, that from Amir Chah, has flowers and none of them have fruits. All the specimens of each of the three gatherings have many of the corky nodes, with the green branchlets that spring from these nodes, galled by insects; these galls look so remarkably like flowers that Dr. Maynard's field-note on the Gazechah-desert specimens describes the plant as a bush with "rich claret-coloured velvety flowers on the branches."

The writer finds the same difficulty in dealing with the Afghan and Baluch specimens of *Calligonum* preserved in the Calcutta Herbarium that Dr. Aitchison has found in dealing with those collected by him during the Delimitation Commission of 1884-85. The only specimen that agrees absolutely with Dr. Maynard's plant is Griffith's n. 95 (*Journal*), which was obtained by Griffith in woods at Jaghun not far from Shikarpur, nothing quite like which has been reported to Herb. Calcutta, since Griffith collected it, till now. The flowers of this plant are less than half the size of those of *C. Polygonoides*, the species common in Rajputana and Scinde and extending thence into Baluchistan; the bark, too, and the habit differ materially from those either of *C. Polygonoides* or of *C. Crinitum* Boiss., of which latter the flowers are still unknown. The present plant has, however, sub-glaucous and striate branchlets as in *C. Crinitum*, and the writer would not have hesitated to refer it tentatively to *C. crinitum* but for the existence of another Griffithian specimen from Afghanistan (K. D. n. 4139), issued as *C. comosum*, which seems to agree with our plant and which has fruits quite unlike those of *C. crinitum*.

Strangely, both of these Griffithian plants (*Journal* n. 95 from Jaghun in Baluchistan and K. D. n. 4139 from Afghanistan) are left unaccounted for by Meissner (*DC. Prodr.*, xiv) and by Boissier (*Fl. Orient.*, iv). That the Afghan plant (n. 4139) is not *C. comosum* appears to the writer to be certain; it accords rather with *C. Caput-Medusæ*; if it be the one species or the other, it cannot be the same as our plant, which has much smaller flowers than either. On the whole the evidence favours the idea that the plant represented by Griffith's n. 95 and by Maynard's specimens

is a species yet to be described, but in the absence of fruits a complete description cannot be given. It differs from Aitchison's undetermined n. 1104, which is a species of § *Pterococcus* apparently very near *C. Pallasia*; also from Aitchison's undetermined n. 267, which appears to be near *C. leucocladum*. Nor does it well agree with Aitchison's n. 30 distributed as "*C. comosum*?", but which is certainly not=Griffith's n. 4139 issued as *C. comosum* and is equally certainly not *C. comosum* itself.

34. RHEUM RIBES Gronov. *Fl. Orient.*, iv, 1003.

Kacha, 3,000 feet; Lon. 61°20' E., *Maynard*.

#### EUPHORBIACEÆ.

35. EUPHORBIA OSYRIDEA Boiss. *Fl. Orient.*, iv, 1092.

Hill-sides near junction of Shista and Lora rivers, 4,000 feet; Lon. 66°30' E., *Maynard*.

#### URTICACEÆ.

36. FICUS CARICA Linn. *Fl. Orient.*, iv, 1154.

Kacha, 3,300 feet; Lon. 61°20' E., *Maynard*

#### GNETACEÆ.

37. EPHEDRA INTERMEDIA Schrenk & Mey. *Fl. Brit. Ind.*, v, 863. *E. pachyclada* Boiss. *Fl. Orient.*, v, 713; *Fl. Brit. Ind.*, v, 641.

Amir Chah, 3,300 feet; Lon. 62°35' E., *Maynard*.

A camel-fodder; the inhabitants burn this and mix the ashes with their tobacco.

#### IRIDEÆ.

38. IRIS SISYRINCHIUM Linn. *Fl. Orient.*, v, 120.

Shorawuk plain, borders of Nushki, 3,000 feet; Lon. 66° E., very plentiful, *Maynard*.

#### LILIACEÆ.

39. ASPHODELUS TENUIFOLIUS Cav. *Fl. Orient.*, v, 314; *Fl. Brit. Ind.*, v, 332.

Hill 8 miles west of Gazechah, 6,000 feet, Lon. 64°50' E., *Webb-Ware*.

This is the *A. fistulosus* of Messrs. Lace and Hemsley's list.

40 GAGEA PERSICA Boiss. *Fl. Orient.*, v, 210; *Fl. Brit. Ind.*, v, 355.

Plain 20 miles north of Nushki, 3,000 feet; Lon. 66° E., *Maynard*.

41. *GAGEA AMBLYOPETALA* Boiss. & Heldr. *Fl. Orient.*, v, 206.

Plain 20 miles north of Nushki, 3,000 feet; Lon.  $66^{\circ}$  E., *Maynard*.

#### GRAMINEÆ.

42. *CYNODON DACTYLON* Linn. *Fl. Orient.*, v, 553.

Desert near Gazechah, 2,500 feet; Lon.  $64^{\circ}50'$  E., *Maynard*.

The creeping stems characteristic of the species in the Indian plains are here replaced by underground widespreading rhizomes, only stems 2 to 3 inches high appearing aboveground at wide intervals.

43. *PHRAGMITES COMMUNIS* Trin. *Fl. Orient.*, v, 563.

Kacha, 3,300 feet; Lon.  $61^{\circ}21'$  E., *Maynard*.

The specimens exactly accord with those issued by Stocks as *Arundo bengalensis* (Stocks n. 1113), which are not accounted for by M. Boissier.

#### FILICES.

44. *ADIANTUM CAPILLUS-VENERIS* Linn. *Fl. Orient.*, v, 730.

Gorge at Gargarok, 4,500 feet; Lon.  $64^{\circ}15'$  E., *Maynard*.

#### FUNGI.

45. *AGARICUS CAMPESTRIS* Linn.

Hill 8 miles west of Gazechah, 6,000 feet; Lon.  $64^{\circ}50'$  E., *Webb-Ware*.

#### LICHENES.

46. *LECANORA* sp.

Hill-sides near camp at junction of Shista and Lora rivers, 4,000 feet; Lon.  $66^{\circ}30'$  E., *Maynard*.

"A beautiful pink lichen with fine white margins." This the writer has not been able to match in Herb. Calcutta.











# THE BOTANY OF THE CHITRAL RELIEF EXPEDITION, 1895.

*By J. F. DUTHIE.*

THE military operations, which were undertaken in connection with the relief of Chitral during the spring and summer of 1895, afforded a good opportunity for investigating the flora of a large tract of unexplored country included within  $71^{\circ}$ — $73^{\circ}$  E. Long. and  $36^{\circ}$ — $34^{\circ}$  N. Lat.

Permission having been obtained for a plant collector from the Botanical Department of Northern India to accompany the expedition, Inayat Khan, an experienced collector, was sent off early in April with orders to report himself to Surgeon-Lieutenant Harriss, who was specially deputed by the Principal Medical Officer to superintend the collection of botanical specimens.

A very interesting collection was obtained of all the plants observed along the route northwards as far as Chitral, and the carefully recorded information supplied by Surgeon-Lieutenant Harriss as regards the locality and the elevation above the sea of each gathering added very much to its value.

This officer unfortunately fell sick about the beginning of July, and as no other officer was available at the time for superintending the work, the plant collector was ordered to return to India.

Early in August I was informed by General Gatacre, C.B., D.S.O., who was in command of the advance brigade, that he had been collecting botanical specimens since the commencement of the campaign. He very kindly offered to make over the whole of his specimens to the Botanical Department; another plant collector was therefore sent to meet him at Mirga in order to complete the collections and bring them back to Saharanpur. This contribution proved to be a most valuable addition to the previous one, as several of the specimens were collected in many out-of-the-way localities which Surgeon-Lieutenant Harriss was unable to visit.

A third contribution was received later in the year from Surgeon-Lieutenant-Colonel Hamilton, whose co-operation was secured by General Gatacre. This collection, which consisted chiefly of plants found in the neighbourhood of Drosh, was very acceptable, as several of the species were not included in the two previous instalments.

I have since received from Colonel Davidson, Commanding at Chitral, a small, but interesting, collection of plants gathered by him on the Dorah Pass, between 14,000 and 15,000 feet above the sea. These also are included in the general list which follows.

In order to render this list as complete as possible I have included the names of several plants, which Captain F. E. Younghusband kindly sent to me from the Chitral district in 1894, together with a few mentioned by Surgeon-Major Giles as occurring in the neighbourhood of Chitral, and collected by him during the Chitral-Kafiristan Expedition in 1884-85 under Colonel (now Sir William) Lockhart.

The majority of the specimens enumerated in the following list were collected between 3,000 and 13,000 feet above the sea. The hot steamy atmosphere which prevails during the summer months in the lower confined portions of the Swat, Panjkora, and other valleys encourages a luxuriant growth of plants, many of which are characteristic of the plains of India; and the extensive cultivation of various crops which is carried on in some of these valleys, where irrigation can be easily applied, must account for the presence of many species which could not otherwise find a home here. Up to 5,000 or 6,000 feet there are large tracts of stony undulating country, where the air is very hot and dry during the summer, and here the vegetation resembles that of Baluchistan and Afghanistan. The flora of the more elevated portions of the country, between the lowest limit of snowfall and the highest limit of vegetation, resembles for the most part that of Kashmir and Baltistan, with the addition of some Central Asian and Siberian forms.

There are some fine forests in the neighbourhood of the Lowari Pass containing chiefly spruce (*Picea Morinda*), silver fir (*Abies Webbiana*), deodar and blue pine (*Pinus excelsa*); yew and pencil cedar (*Juniperus macropoda*) also occur, together with horse-chestnut, maple (*Acer cæsium*), *Prunus Padus*, *Pyrus lanata*, and *Ulmus Watlichiana*. The prevailing oak in this part of the country is *Quercus Ilex*, *Q. incana* and *dilatata* also occur. An excellent series of photographs taken by Sergeant-Major Develin, R.E., under the supervision of General Gatacre, gives a very good idea of the country between Nowshera and Chitral.

The total number of species and varieties included in the following list amounts to 934; they represent 93 natural orders and 459 genera.

The natural orders containing the largest number of species are :—*Compositæ* 72, *Labiatae* 62, *Gramineæ* 61, *Leguminosæ* 45, *Rosaceæ* 44, *Ranunculaceæ* 38, *Musci* 33, *Cruciferae* 29, *Filices* 27, *Caryo-*

*phyllæ* 28, *Umbelliferæ* 27, *Liliaceæ* 25, *Boraginææ* 24, *Scrophularinææ* 23, *Polygonaceæ* 21.

The number of species and varieties not included in the flora of British India is 82; of these two have been recently described, *viz.*, *Corydalis cyrtocentra*, Prain, in *Journ. As. Soc., Beng., Vol. LXV, pt. 2, p. 20* (1896); and *Sophora mollis*, Grah. var. *Duthiei*, Prain, in *Journ. As. Soc., Beng., Vol. LXVI, pt. II, No. 2* (1897), p. 467. The description of a new species of *Androsace* (*A. Harrissii*) will be found in its place in the list.

In the Flora of British India, Volume VII, page 329, mention is made of a new species of *Diplachne* (*D. Gatacrei*), a description of which by Dr. Stapf will shortly be published in the Kew Bulletin.

Of the ferns, two new species, *Asplenium Mackinnoni* and *Nephrodium ramosum*, were described by Mr. C. W. Hope in a paper on the ferns of the Chitral Relief Expedition, published in the March number of the Journal of Botany for 1896, p. 122. The former had been collected previously in many localities between Kashmir and Kumaon, also in Sikkim; but Mr. Hope having detected some important differences between it and *A. nigripes*, Mett., with which it had been confused, has published it as a new species. *Nephrodium ramosum* had also been gathered before in Afghanistan and on the Western Himalaya as far east as Tehri Garhwal, but had not been correctly identified.

The most interesting ferns, however, collected on this expedition are *Pteris ludens*, Wall., and *Lygodium microphyllum*, R. Br., found by General Gatacre in the Ziarat Valley, the former at 5,000 and 8,000 feet, and the latter at 5,000 feet above the sea. Mr. Hope remarks that the most westerly extension of *P. ludens* in the Indian Peninsula is in Orissa in about  $21\frac{1}{2}^{\circ}$  N. Lat. and  $86^{\circ}$  E. Long.; while *L. microphyllum* was not known to occur west of Assam, Bhutan, and the plain of North Bengal.

I must not omit to mention my obligations to Surgeon-Major D. Prain for his kind assistance in the determination of the *Leguminosæ*, and to Mr. C. W. Hope in regard to the ferns. To Dr. Brotherus I am also much indebted for the names of all the mosses collected during the expedition.

## A LIST OF THE BOTANICAL SPECIMENS COLLECTED DURING THE CHITRAL RELIEF EXPEDITION OF 1895.

*Names preceded by an asterisk are not included in the Flora of British India.*

### RANUNCULACEÆ.

*Clematis connata*, D.C. Mirga, 6,000'—8,000' (Gatacre).

*C. grata*, Wall. Kashgaria, 5,000'; Mirga Valley, 7,200'; Zakhannah Pass, 8,500' (Gatacre); near Drosh (Hamilton).

*C. graveolens*, Lindl. Arnawei Valley (Gatacre); Chitrál Valley, 4,000'—5,000' (Hamilton).

*C. montana*, Buch-Ham. Mirga; Jambatai, 5,000'—6,000' (Harriss); Gujar Valley (Gatacre).

*C. orientalis*, L. Robat, 4,000'; Laram, 6,000'—7,000' (Gatacre); Chitrál district (Younghusband, 1894).

*Thalictrum elegans*, Wall. Chitrál district (Hamilton).

*T. foliolosum*, D.C. Lowári Pass, 10,500' (Harriss).

\* *T. isopyroides*, C. A. Mey. Chitrál district (Hamilton); Distrib.: Persia, Afghanistan, Baluchistán, and North Asia.

*T. pedunculatum*, Edgew. Ziárat Valley, 4,000'—7,000'; Jambatai, 6,000'; Ziarat, 8,000' (Harriss).

*Anemone biflora*, D.C. Chitrál district (Hamilton), (Younghusband, 1894).

*A. Falconeri*, Thoms. Bundai, 7,000' (Harriss).

*A. narcissiflora*, L. Jambatai, 10,000'; Chitrál district, 11,000' (Harriss).

*A. obtusiloba* D. Don. Ashreth Valley, 6,000' (Gatacre); Dir, 10,000'; Lowári Pass, 10,000'—12,000' (Harriss).

*Adonis æstivalis*, L. Bundai; Jambatai, 6,000' (Harriss); Ziárat Valley, 4,000'—7,000' (Gatacre).

*Callianthemum cachemirianum*, Camb. Bundai, 9,000'; Dir, 10,000' (Harriss).

*Ranunculus arvensis*, L. Jambatai, 5,000'—6,000' (Harriss).

*R. falcatus*, L. Chitrál district (Hamilton).

*R. hirtellus*, Royle. Jambatai, 5,000'—6,000'; Gujar, 8,500' (Harriss).

*R. lætus* Wall. Chashma (Harriss); below Laram Pass, 4,000' (Gatacre); near Drosh, 4,000'—5,000' (Hamilton); Chitrál district (Younghusband, 1894).

*R. muricatus*, L. Baraul Valley, 5,000'; Gujar Valley, 5,000' (Gatacre); Chitrál district (Younghusband, 1894).

\* *R. rufosepalus*, Franch. Chitrál district, 11,000' (Harriss); Dorah Pass, 14,000'—15,000' (Davidson). Distrib.: Turkestan.

*R. sceleratus*, L. Jambatai, 5,000'—6,000' (Harriss).

*Caltha palustris*, L., var. *alba*. Bundai, 8,000'; Dir, 10,000'—11,000'; Lowári Pass, 7,000'—10,000' (Harriss). Ashreth Valley, 6,000'; Zakhannah Valley, 6,000'; Mirga, 7,200' (Gatacre).

*Trollius acaulis*, Lindl. Lowári Pass, 11,000' (Harriss).

*Aquilegia vulgaris*, L. Gujar Valley, 7,000'—8,000'; Mirga, 9,000'; Bundai, 9,000'; Lowári Pass, 10,500' (Harriss); Ziárat Valley, 6,000'—8,000' (Gatacre).

*A. vulgaris*, L., subsp. *Moorcroftiana*, var. *afghanica* (Bruhl). Gujar Valley, 5,000' (Gatacre).

*A. vulgaris*, L., subsp. *nivalis*, var. *paradoxa*. (= *A. glauca* Lindl.). Ziárat Valley, 8,000'; Lowári Pass, 10,000'—11,000' (Gatacre).

*Delphinium Brunonianum*, Royle. Dorah Pass, 14,000'—15,000' (Davidson).

*D. cashmirianum*, Royle. Lowári Pass, 9,800'; Arnawei Valley (Gatacre).

*D. denudatum*, Wall. Ziárat, 7,200' (Harriss); Ashreth Valley, 6,000' (Gatacre).

*D. saniculæfolium*, Boiss., var. Drosh. 4,500' (Harriss); Ziárat Valley, 6,000' (Gatacre).

*D. uncinatum*, H.f. & T. Dir., 5,000'; Jambatai, 5,000—6,000' (Harriss).

*D. vestitum*, Wall. Ziárat Valley, 9,000' (Gatacre).

*Aconitum heterophyllum*, Wall. Lowári Pass, 9,000'; Zakhannah Pass, 9,500' (Gatacre).

*A. Lycotomum*, L. Ziárat, 7,500' (Harris); Ashreth Valley, 6,000' (Gatacre).

*A. Napellus*, L., var. Mirga 7,200'; Zakhannah Pass, 10,500' (Gatacre).

*Actæa spicata*, L. Ziárat, 7,000'—10,000' (Harriss); Gujar Valley, 5,000'; Ashreth Valley, 5,000'; Lowári Pass, 9,000' (Gatacre).

*Pæonia anomala*, L. (P. Emodi, Wall.) Ziárat Valley, 7,000'—8,000' (Harriss, Gatacre); Gujar 7,000'—9,000' (Harriss); Zakhannah Valley, 5,000'; Mirga, 8,000' (Gatacre).

#### BERBERIDEÆ.

*Berberis Lycium*, Royle. Dir, 4,000'—6,000'; Mirga (Harriss) Ashreth Valley, 5,000'; Kolandai, 5,800' (Gatacre).

*B. vulgaris*, L. Jambatai 6,500' (Harriss).

*B. vulgaris*, L. var. Bundai, 9,600' (Harriss).

*Podophyllum Emodi*, Wall. Jambatai, 6,000'; Bundai, 6,000'—7,000'; Dir, 8,000'—10,000'; Gujar, 8,000' (Harriss); Gujar Valley, 6,000'; Ziárat Valley, 5,000'—8,000'; Mirga, 7,200' (Gatacre).

## PAPAVERACEÆ.

*Papaver dubium*, L., var. *glabrum*. Bundai, 4,000' (Harriss); Baraul Valley, 5,000'; Lowári Hills, 10,000 (Gatacre).

\* *Hypecoum parviflorum*, Kar. & Kir. Chitrál district (Hamilton)

*Corydalis cornuta*, Royle. Mirga hills, 8,500' (Gatacre).

\* *C. cyrtocentra*, Prain. Chitrál district (Younghusband, 1894) (Hamilton).

*C. diphylla*, Wall. (= *C. rutæfolia*, Fl. Br. Ind. not of Sibth). Bundai; Dir, 10,000'; Lowári Pass, 8,000'—12,000' (Harriss); Ziárat Valley, 7,000'; Ashreth Valley (Gatacre).

*C. Gortschakovii*, Schrenk. (not of Fl. Br. Ind.) Dorah Pass, 14,000'—15,000' (Davidson).

*C. Moorcroftiana*, Wall. Lowári Pass, 9,000'; Bundai, 9,500' (Harriss); Dir Valley, 5,000'; Ziárat Valley, 5,000'; Gujar Valley, 6,000'; Mirga Valley, 7,000' (Gatacre).

*Fumaria parviflora*, Lamk. Jambatai, 5,000'—6,000'; Bundai (Harriss).

## CRUCIFERÆ.

*Matthiola odoratissima*, R. Br. Gujar hills, 8,000' (Gatacre).

*Nasturtium palustre*, D.C. Jambatai, 5,000'—6,000' (Harriss).

*Barbarea vulgaris*, R. Br. Gujar, 8,000'—9,000' (Harriss); Chitrál district (Hamilton).

*Arabis alpina*, L. Lowári Pass, 11,000' (Harriss).

*A. amplexicaulis*, Edgew. Dir, 4,500'; Jambatai, 6,000'; Ziárat, 7,000'—8,000'; Mirga, 9,000' (Harriss).

*A. auriculata*, Lamk. Jambatai, 5,500' (Harriss).

\* *A. bijuga*, Watt. Chitrál district (Hamilton).

*A. perfoliata*, Lamk. (*A. glaba*, Crantz). Lowári Pass, 9,000' (Harriss).

*Cardamine hirsuta*, L. Mirga, 9,000' (Harriss).

*C. impatiens*, L. Jambatai, 5,000'—6,000'; Dir, 10,000'; Bundai (Harriss); Gujar Valley, 5,000' (Gatacre).

*Draba alpina*, L. Chitrál district, 11,000' (Harriss).

\* *Erophila præcox*, D.C. Chitrál district (Younghusband, 1894); Dorah Pass 11,000'—15,000' (Davidson). Distrib.: westward to Europe.

*Malcomia africana*, R. Br. Chitrál district (Younghusband, 1894).

*M. strigosa*, Boiss. Chitrál district (Younghusband, 1894) (Hamilton).

*Sisymbrium Alliaria*, Scop. Jambatai, 5,000'—6,000'; Ziárat, 7,500' (Harriss).

*S. Columnæ*, Jacq. Dir Valley (Harriss).

*S. mollissimum*, C. A. Mey. Mirga (Harriss); Zakhannah Valley, 6,000' (Gatacre).

*S. Sophia*, L. Bundai, 4,000' (Harriss).

*S. strictum*, H. f. & T. Mirga (Harriss).

*S. Thalianum*, J. Gay. Lowári Pass, 10,000' (Harriss).

*Eutrema primulæfolium*, H. f. & T. Dir, 10,000' (Harriss).

*Erysimum altaicum*, C. A. Mey. Ziarat, 10,000' (Harriss); Dir Valley, 6,000' (Gatacre).

*Capsella Bursa-pastoris*, Medic. Dir, 11,000' (Harriss).

\* *Heldreichia silaiifolia*, H. f. & T. Chitrál district, 11,000' (Harriss). Distrib: Afghanistán.

*Thlaspi alpestre*, L. Bundai, 7,000'; Lowári Pass, 8,000'—10,300' (Harriss); Chitrál district (Younghusband 1894).

*T. cardiocarpum*, H. f. and T. Jambatai, 5,000'—6,000' (Harriss); Ziárat Valley, 7,000' (Gatacre).

*Eruca sativa*, Mill. Mirga, 7,700' (Gatacre).

\* *Isatis Stocksii*, Boiss. Chitrál district (Hamilton).

*I. tinctoria*, L. Dir, 5,000'; Drosh, 7,000' (Harriss); Distrib.: Baluchistán.

\* *Chorispora* sp. Chitral, 11,000' (Harriss) (Giles, Gilgit Exped.).

#### CAPPARIDEÆ.

*Cleome viscosa*, L. Robat, 4,000'; near Drosh, 4,000'—5,000' (Gatacre); Chitral district (Younghusband, 1894).

*Capparis spinosa*, L. Ziarat Vally, 5,000' (Gatacre).

#### VIOLACEÆ.

*Viola canina*, L., var. Lowári Pass, 10,000'—11,000' (Harriss); Chitrál district (Hamilton).

*V. Patrinii*, Ging. Chitral district (Hamilton) (Younghusband, 1894).

*V. serpens*, Wall. Bundai, 8,000'; Mirga, 9,000'; Dir, 10,000' (Harriss).

#### POLYGALEÆ.

*Polygala abyssinica*, R. Br. Broz, 9,000'; Bundai (Harriss).

*P. sibirica*, *L.* Jambatai, 4,500'—6,000' (Harriss); Drosh, 4,000'—5,000' (Hamilton).

### CARYOPHYLLÆ.

\* *Velezia rigida*, *L.* Dir, 6,000' (Harriss); Distrib.: Mediterranean, Europe, and North Africa.

*Dianthus anatolicus*, *Boiss.* Ziárat, 7,000'—8,000'; Chitrál district, 6,000' (Harriss) (Younghusband, 1894).

*D. crinitus*, *Sm.* Sharbat, 4,000' (Harriss); Chootiatan, 5,000 (Gatacre).

\* *Gypsophila* *sp.* Chitral, 7,000' (Harriss) (Younghusband, 1894.)

*Saponaria Vaccaria*, *L.* Chitrál district, 4,000'—5,000' (Harriss).

\* *Silene afghanica*, *Rohrb.* Chitrál district (Hamilton), Distrib.: Afghanistan.

*S. arenosa*, *C. Koch.* Broz, 5,200'; Chitral district, 4,800' (Harriss); Ashreth Valley, 5,000' (Gatacre).

*S. conoidea*, *L.* Jambatai 5,000'—6,000' (Harriss); Baraul Valley; 7,000', Ziárat Valley, 5,000'—8,000' (Gatacre); Drosh, 4,000'—5,000' (Hamilton); Chitrál district (Younghusband, 1894).

*S. Cucubalus*, *Wibel.* (*S. inflata*, Smith). Jambatai, 6,500'; Gujar, 8,000' (Harriss); Gujar Valley, 5,000'; Mirga, 8,500'; Laram, 7,000' (Gatacre); Chitrál district (Younghusband, 1894).

*S. Griffithii*, *Boiss.* Jambatai, 6,000'; Ashreth (Harriss).

*S. Moorcroftiana*, *Wall.* Chitrál district (Younghusband, 1894).

*S. tenuis*, *Willd.* Mirga hills, 9,000' (Gatacre).

*Cucubalus baccifer*, *L.* Lowári Pass, 9,000' (Harriss); Mirga, 7,200' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*Lychnis himalayensis*, *Edgew.* Ziárat hills, 9,000 (Gatacre).

*L. indica*, *Benth.* Lowári range, 6,000 (Gatacre).

\* *Cerastium dichotomum*, *L.* Lowári hills, 10,000 (Gatacre). Distrib.: through Persia to Europe and North Africa.

*C. glomeratum*, *Thuill.* Bundai, 4,000'; Gujar, 8,000'; Mirga, Lowári Pass, 10,500' (Harriss).

*C. trigynum*, *Vill.* Lowári Pass, 9,000—11,000' (Harriss); Zakhannah Pass, 9,500' (Gatacre); Dorah Pass, 14,000'—15,000' (Davidson).

*Stellaria bulbosa*, *Wulf.* Dir, 10,000' (Harriss).

*S. crispata*, *Wull.* Ziárat, 7,500' (Harriss); Mirga, 7,800' (Gatacre).

*S. media*, *Cyrrill.* Jambatai, 5,000'—6,000' (Harriss).

*S. uliginosa*, *Murr.* Ziárat, 7,000' (Harriss).

*Arenaria foliosa*, Royle. Gujar, 9,000'—11,000' (Harriss); Mirga, 7,000'—8,500' (Gatacre); Chitrál District (Hamilton), (Young-husband, 1894).

*A. Griffithii*, Boiss. Chitrál District, 10,000' (Harriss) (Young-husband, 1894).

*A. holosteoides*, Edgew. Ziárat, 7,500' (Harriss)

*A. orbiculata*, Royle. Lowári Pass, 10,500' (Harriss).

*A. serpyllifolia*, L. Jambatai, 4,000' (Harriss).

*Sagina procumbens*, L. Ziárat, 7,200'; Dir, 10,000' (Harriss).

#### TAMARISCINEÆ.

*Tamarix gallica*, L. Markandi, 6,000' (Harriss); near Chitrál 6,000' (Gatacre).

*Myricaria germanica*, Desv. Chitrál Valley, 4,600' (Harriss).

#### HYPERICINEÆ.

*Hypericum lysimachioides*, Wall. Dir, 5,600' (Harriss).

*H. perforatum*, L. Bundai (Harriss); Laram, 7,200'; Mirga, 7,500'; Arnawei Valley, 8,000'; Lowári range, 13,000'; Chitrál Valley, 4,800' (Gatacre).

\**H. scabrum*, L. Ziárat, 8,000'; Chitrál, 8,000' (Harriss), (Younghusband, 1894). Distrib.: Persia, Asia Minor.

#### MALVACEÆ.

*Althæa rosea*, Cav. Ashreth, 6,000' (Harriss); Arnawei Valley, 5,800'; Chitrál Valley, 5,000'—6,000' (Gatacre).

*Lavatera cachemiriana*, Camb. Ziárat, 7,500' (Harriss); Dir Valley, 5,000'; Gujar Valley, 7,000'—8,000' (Gatacre).

*Malva parviflora*, L. Jambatai, 5,000'—6,000' (Harriss); Mirga, 7,700' (Gatacre).

*M. rotundifolia*, L. Gujar, 8,000'; Arnawei Valley, 9,500' (Gatacre); near Drosh, 4,000'—5,000' (Hamilton).

#### LINEÆ.

*Reinwardtia trigyna*, Planch. No locality (Gatacre).

#### ZYGOPHYLLÆÆ.

*Tribulus terrestris*, L. Guirat (Harriss).

#### GERANIACEÆ.

*Geranium collinum*, Steph. Ziárat Valley, 5,000'—8,000'

Zakhannah Pass, 9,500'; Laram Pass, 9,000' (Gatacre); Chitrál district (Younghusband, 1894.)

*G. nepalense*, Sweet. Bundai, 4,000' (Harriss); Arnawei Valley (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*G. pratense*, L. Gujar, 8,400'; Lowari Pass, 10,500' (Harriss).

*G. rivulare*, Vill. (*G. aconitifolium*, L'Herit.) Chitrál District (Younghusband, 1894).

*G. rotundifolium*, L. Jambatai, 6,000' (Harriss).

*G. Tuberaria*, Camb. Chitrál District (Hamilton).

*G. Wallichianum*, D. Don. Mirga, 7,000' (Harriss) (Gatacre); Lowari Pass, 8,500' (Harriss).

*Erodium cicutarium*, L. Herit. Chitrál District, 4,000' (Harriss).

*Oxalis corniculata* L. Jambatai, 6,000'; Bundai, 4,000' (Harriss); Laram, 7,000'; Chitrál Valley, 6,000' (Gatacre).

*Impatiens amphorata*, Edgew. Ziarat, 7,500'—11,000'; Broz, 8,000' (Harriss).

*I. Balsamina*, L. Drosh, 4,000'—5,000' (Hamilton).

*I. brachycentra*, Kar. and Kir. Dir, 6,500'; Mirga, 7,500'; Gujar, 8,500' (Harriss); Gujar Valley, 7,500'; Lowári range, 9,000' (Gatacre).

*I. laxiflora*, Edgew. Mirga, 6,000' (Gatacre).

*I. Roylei*, Walp. Gujar, 8,000'; Mirga 8,500'; Zakhannah Pass, 8,500' (Gatacre).

*I. scabrida*, Dc. Gujar, 8,000' (Harriss); Laram, 7,000'; Mirga, 8,000'—9,500' (Gatacre).

#### RUTACEÆ

\* *Ruta* sp. near *R. tuberculata*, (Forsk.) Drosh, 4,800' (Harriss).

*Peganum* s. *mala*, L. Dir, 4,500' (Harriss); Chitrál District (Younghusband, 1894).

*Dictamnus albus*, L. Ziárat, 8,000' (Harriss).

*Zanthoxylum alatum*, Roxb. Below Laram Pass, 4,000' (Gatacre).

*Skimmia Laureola*, Sieb and Zucc. Dir, 10,500' (Harriss); Gujar Valley, 7,000'; Mirga, 9,200' (Gatacre).

#### MELIACEÆ.

*Melia Azedarach*, L. Jambatai, 5,000'—6,000' (Harriss).

#### CELASTRINEÆ.

*Euonymus grandiflorus*, Wall. Jambatai, 6,000' (Harriss).

*E. Hamiltonianus*, Wall. Ziárat 7,000'—8,000' (Harriss).

### RHAMNEÆ.

*Zizyphus sativa*, Gaertn. (*Z. vulgaris*, Lamk.) Between Mirga and Dir, 6,500' (Harriss), Darora, 5,000' (Gatacre).

*Rhamnus dahurica*, Pall. Jambatai, 5,000'—6,000' (Harriss).

*Sageretia Brandrethiana*, Aitch. Bundai, 4,000'; Dir, 5,600' (Harriss).

*S. theezans*, Brongn. Between Guirat and Chitrál, 4,800' (Harriss).

### AMPELIDEÆ.

\**Vitis persica*, Boiss. Sharbat, 8,000' (Harriss). Distrib.: Persia, Afghanistan.

*V. vinifera*, L. Bundai, Chitrál, 4,900' (Harriss); Ziárat Valley, 4,500'—7,000' (Gatacre).

### SAPINDACEÆ.

*Æsculus indica*, Colebr. Mirga, 7,000'—9,000' (Harriss); Ziárat Valley, 7,000' (Gatacre).

*Acer cæsiunum*, Wall. Ziárat, 7,400' (Harriss); Mirga, 9,200' (Gatacre).

*Dodonæa viscosa*, Jacq. Baraul Valley, 5,000' (Gatacre).

*Staphylea Emodi*, Wall. Mirga, 7,400' (Gatacre).

### ANACARDIACEÆ.

*Rhus punjabensis*, J. L. Stew. Mirga, (Harriss).

*Pistacia Khinjuk*, Stocks. (*P. integerrima* Stewart). Markandi 6,000' (Harriss); Arnawei Valley, 4,800' (Gatacre).

\**P. mutica*, F. and M. Chitrál Valley, 5,000' (Gatacre). Vern. "Sawere." Distrib.: Afghanistan, Persia, Mediterranean

### LEGUMINOSÆ.

*Crotalaria albida*, Heyne. Laram, 7,000' (Gatacre)

*Argyrolobium roseum*, Faub. and Spach. Gujar Valley, 6,000' (Gatacre).

*Trigonella corniculata*, L. Mirga, 7,000'—8,000' (Harriss); Kolundai, 5,000' (Gatacre).

*T. Emodi*, Benth. Bundai (Harriss).

*Medicago lupulina*, L. Jambatai, 4,500' (Harriss).

*M. sativa*, L. Chitral district, 4,600' (Harriss).

*Melilotus officinalis*, Lamk. Arnawei Valley (Gatacre).

*Trifolium repens*, L. Mirga, 7,000'—8,000'; Jambatai, 5,000'—6,000' (Harriss); Chitral District (Ycunghusband).

*T. resupinatum*, L. Chitral, 4,900' (Harriss).

*Lotus corniculatus*, L. Jambatai Pass (Harriss); Chitrál District (Younghusband).

\**L. major*, Scop. Chitrál District (Younghusband). Distrib.: Europe.

\**Psoralea drupacea*, Bunge. Drosh, 4,500' (Harriss) (Hamilton); Zakhannah Valley, 5,000' (Gatacre). Distrib.: Persia, Turkestan.

*Indigofera Gerardiana*, R. Grah. Mirga, 6,000' (Harriss); Gujar Valley, 5,000'—6,000' (Gatacre).

*I. Gerardiana*, R. Grah, var. *heterantha*. Bundai, 7,000'; Gujar, 8,500'; Ziárat (Harriss); Laram, 7,000' (Gatacre).

*I. pulchella*, Roxb. Baraul Valley, 4,000'—5,000' (Gatacre).

\**Caragana decortisans*, Hemsl. (*C. ambigua*, Aitch., not of Stocks) Broz, 9,000' (Harriss). Distrib.: Afghanistan.

\**Calophaca depressa*, Oliv. Between Guirat and Chitrál, 4,700' (Harriss), Distrib.: Gilgit district (Giles, Duthie).

*Astragalus chlorostachys*, Lindl. Mirga, 7,000'—8,000' (Harriss).

*A. graveolens*, Buch.-Ham. Jambatai, 6,000' (Harriss).

*A. subulatus*, Pall. Drosh, 4,000'—5,000'; Broz, 8,000' (Harriss).

\**Alhagi camelorum*, Fisch. Dorah Pass (Giles).

*Hedysarum Falconeri*, Baker. Mirga (Harriss); Dir Valley, 5,000' (Gatacre).

*H. astragaloides*, Benth. Chitrál district (Younghusband).

*Aeschynomene indica*, L. Dir. (Harriss); Drosh, 4,000'—5,000' (Hamilton).

*Desmodium podocarpum*, D.C. Chakdára (Harriss).

*D. tiliaefolium*, G. Don. Mirga Valley, 6,000'—8,000' (Harriss) (Gatacre); Gujar Valley, 7,200' (Gatacre).

*Lespedeza juncea*, Pers. Drosh, 4,000'—5,000' (Hamilton).

*L. juncea* Pers., var. *kanaorensis*, Camb. Dir, 6,500' (Harriss).

\**L. sericea*, Miq., var. *longepetiolata*. Darora, 5,000' (Gatacre). Distrib.: Nagasaki (Oldham No. 328), Sadya, Upper Assam, and S. W. Yunan; also Maingay No. 650 in part.

*Vicia mollis*, Benth. Ziárat, 9,000' (Harriss).

*V. sepium*, L. Lowári Pass, 9,000' (Harriss); Ziárat Valley, 7,000'; Arnawei Valley, 9,000' (Gatacre).

*V. tenuifolia*, Roth. Ziárat, 8,000' (Harriss); Baraul Valley, 5,000'; Dir Valley, 6,000' (Gatacre).

*Lens esculenta*, Moench. Mastuj, (Giles). Probably cultivated.

*Lathyrus altaicus*, Ledeb. Lowári Pass, 9,000'—10,000' (Harriss) (Gatacre); Ziárat Valley, 7,000' (Gatacre).

*L. Aphaca*, *L.* Chitral Valley, 6,000' (Gatacre).

*L. montanus*, *Bernh.* (*L. luteus*, Baker) Ziárat, 10,000'; Lowári Pass, 10,500' (Harriss); Gujar Valley, 7,000' (Gatacre).

*L. pratensis*, *L.* Lowári Pass, 9,000' (Harriss); Mirga hills, 7,000'—9,000' (Gatacre).

*L. sativus*, *L.* Between Guirat and Chitrál, 4,700' (Harriss). Cultivated crop.

*Glycine hispida*, *Maxim.* Darora, 5,000' (Gatacre). A cultivated crop.

*Phaseolus Mungo*, *L.* Dir Valley, 4,200' (Gatacre). A cultivated crop.

*P. vulgaris*, *L.* Arnawei Valley, 5,000' (Gatacre). A cultivated crop.

*Vigna Catiang*, *Walp.* Kashgaria, 5,000'; Panakot, 5,000' (Gatacre). A cultivated crop.

*Rhynchosia pseudo-cajan*, *Camb.* Swat Valley, 3,000' (Gatacre).

*Sophora mollis*, *R. Grah.* Bundai; Jambatai, 6,500' (Harriss); Lowári Pass, 10,200'; Laram (Gatacre); Chitrál district (Younghusband).

\**S. mollis*, *R. Grah.*, *var. Duthiei*, Prain in Journ. As. Soc., Bengal, Vol. LXVI. pt. II, No. 2 (1897) 467. Mirkandi, 5,000' (Harriss). Distinguished by its wingless pods.

## ROSACEÆ.

*Prunus Armeniaca*, *L.* Bundai, 4,000' (Harriss).

\**P. brahuica*, *Aitch. and Hemsl.* Ashreth Valley, 5,000' (Gatacre); Gujar, 8,500'—9,500' (Harriss). Distrib.: Afghanistan.

*P. Cerasus*, *L.* Bundai, 4,000'; Chitrál, 4,900' (Harriss). Cultivated.

*P. Padus*, *L.* Ziárat, 7,000'—8,000' (Harriss).

*P. persica*, *Stokes.* Bundai, 4,000' (Harriss). Cultivated.

*P. prostrata*, *Labill.* Jambatai, 6,000' (Harriss); Chitral district (Younghusband).

*Spiræa brahuica*, *Boiss.* Markandi, 6,000' (Harriss); Chitral district (Younghusband).

*S. canescens*, *D. Don.* Mirga, 8,000' (Harriss); Ashreth Valley, 6,000'; Ziárat Valley, 8,000' (Gatacre).

*S. sorbifolia*, *L.* Ashreth (Harriss); Gujar Valley, 5,000'—7,000'; Mirga, 7,200' (Gatacre); Chitrál district (Younghusband).

*S. vestita*, *Wall.* Mirga (Harriss); Gujar Valley, 6,000'; Mirga, 7,200'; Arnawei Valley (Gatacre).

*Rubus fruticosus*, L. Bundai, 4,000'; Drosh, 4,500'; Chitrál, 4,900' (Harriss); Arnawei Valley; Robat, 4,000' (Gatacre); Chitrál district (Younghusband).

*R. lasiocarpus*, Sm. Jambatai, 5,000'—6,000'; Dir, 5,600 (Harriss).

*R. niveus*, Wall, var. *Mirga*. Broz, 4,600' (Harriss).

*R. parvifolius*, L. (*R. purpureus*, Bunge). Ziárat, 9,000' (Harriss); Gujar Valley, 5,000' (Gatacre).

*R. pungens*, Camb. Ziárat, 7,000'—8,000' (Harriss).

*Geum elatum*, Wall. Lowári Pass, 9,000'—11,000' (Harriss) (Gatacre); Zakhannah Pass, 9,500' (Gatacre).

*G. urbanum*, L. Ziárat, 7,800'; Mirga, 7,000'—8,000' (Harriss) (Gatacre).

*Fragaria indica*, Andr. Dir, 6,500' (Harriss).

*F. vesca*, L. Jambatai, 6,000'; Ziárat, 8,000' (Harriss); Mirga, 7,500' (Gatacre).

*Potentilla desertorum*, Bunge. Ashreth, 11,000'; Ziárat, 9,000' (Harriss).

*P. fragarioides* L. Lowári Pass, 10,000' (Harriss).

*P. gelida*, C. A. Mey. Ziárat, 9,000'; Lowári Pass, 10,500' (Harriss); Dorah Pass, 14,000'—15,000' (Davidson).

*P. reptans*, L. Jambatai, 5,000'—6,000'; Bundai (Harriss); Chitrál District (Younghusband).

*P. Sibbaldi*, Haller, F. Lowári Pass, 10,000'; Mirga (Harriss).

*P. Sibbaldi*, Haller f., var. *micrantha*. Zakhannah Hills, 10,800' (Gatacre).

*P. supina*, L. Jambatai, 5,000'—6,000'; between Drosh and Guirat, 4,800' (Harriss).

*Agrimonia Eupatoria*, L. Chakdara; Dir, 5,400' (Harriss).

*Poterium Sanguisërba*, L. Bundai, 4,000' (Harriss).

*Rosa Beggeriana*, Schrenk. (*R. anserinæfolia*, Boiss.) Dir; Sharbat, 8,000' (Harriss).

\* *R. alba*, L. Jambatai, 5,000'; Bundai, 4,000'; Ziarat, 4,000' (Harriss). Distrib.: Afghanistan, Caucasus.

*R. damascena*, Mill. Mundia, 3,000' (Harriss). Cultivated.

*R. macrophylla*, Lindl. Mirga, 7,200' (Gatacre).

*R. moschata*, Herrm. Mirga; Bundai (Harriss).

*R. Webbiana*, Wall. Dir; Ziarat, 7,000'—10,000'; Bundai; Chitrál district, 9,000' (Harriss).

\* *R. zanthina*, Lindl. (*R. Ecæ*, Aitch.). Jambatai district, 10,000'; Chitrál district, 9,000' (Harriss). Distrib.; Afghanistan.

*Pyrus communis*, L. Jambatai (Harriss). Cultivated.

- P. Cydonia*, L. Bundai, 4,000' (Harriss) Cultivated.  
*P. lanata*, D. Don. Mirga, 7,000' (Gatacre).  
*P. Malus*, L. Bundai, 4,000' (Harriss). Cultivated.  
*P. Pashia*, Buch-Ham. Sharbat (Harriss); Kashgaria, 5,000' (Gatacre).  
*Cratægrus Oxyacantha*, L. Jambatai, 6,000'; Gujar, 8,500' (Harriss); Chitral district (Younghusband).  
*Cotoneaster bacillaris*, Wall. Jambatai, 6,000' (Harriss); Laram, 7,000' (Gatacre).  
*C. microphylla*, Wall. Bundai, 9,600' (Harriss).  
*C. nummularia*, F. and M. Jambatai (Harriss); Gujar Valley, 5,000'; Kashgaria, 5,000' (Gatacre).

#### SAXIFRAGACEÆ.

- Saxifraga ligulata*, Wall. Jambatai; Bundai, 7,000' (Harriss).  
*S. Stracheyi*, H. f. and T. Lowári Pass, 11,500'; Chitrál district, 11,000' (Harriss) (Younghusband, 1894).  
*Parnassia ovata*, Ledeb. Chitrál district (Younghusband, 1894).  
*Deutzia staminea*, R. Br. Jambatai, 5,000'—6,000'; Dir; Gujar, 8,500'; Chakdara (Harriss).  
*Ribes glaciale*, Wall. Lowári Pass, 11,000' (Harriss).  
*R. rubrum*, L. Mirga, 7,400' (Gatacre).

#### CRASSULACEÆ.

- \* *Cotyledon Lievenii*, Ledeb. Ashreth; Chitrál district, 10,000'—11,000' (Harriss). Distrib.: Persia, Siberia.  
 \* *C. papillosa*, Aitch. and Hemsl. Robat, 4,000' (Gatacre) Distrib.: Afghanistan.  
*Sedum adenotrichum*, Wall. Bundai, 4,000'—5,000'; Ziarat, 7,800'; Ashreth (Harriss).  
*S. asiaticum*, Spreng. Lowári Pass, 11,000' (Harriss); Zakhannah Pass, 9,800'; Lowári Pass, 13,500' (Gatacre).  
*S. Ewersii*, Ledeb. Mirga, 7,000'—9,000'; Lowári Pass, 9,000' (Gatacre); Chitrál district (Younghusband, 1894).  
*S. linearifolium*, Royle. Zakhannah Pass, 9,500' (Gatacre).

#### HAMAMELIDEÆ.

- Parrottia Jacquemontiana*, Dcne. Jambatai, 6,300' (Harriss); Dir Vally, 4,000'; Ashreth Valley, 5,000' (Gatacre).

#### MYRTACEÆ.

- Myrtus communis*, L. Panjkora Valley, 4,000'; Laram, 4,000'—7,000' (Gatacre).

## LYTHRACEÆ.

*Ammannia baccifera*, L. Drosh, 4,000'—5,000' (Hamilton).

*Punica Granatum*, L. Dir Valley; Chitral, 4,900' (Harriss).

## ONGÆRACEÆ

*Epilobium angustifolium*, L. Ziarat Valley 7,000' (Harriss) (Gatacre); Chitrál district (Younghusband, 1894).

*E. hirsutum*, L. Mirga, 7,500' (Harriss); Drosh, 4,000'—5,000' (Hamilton).

*E. hirsutum*, L. var *sericeum*. Chitrál district, 4,000'—5,000' (Harriss) (Gatacre), (Younghusband, 1894).

*E. latifolium*, L. Dorah Pass, 14,000'—15,000' (Davidson).

*E. roseum*, Schreb. Mirga hills, 8,000'—9,000' (Gatacre).

*E. teragonum*, L. Mirga, 7,000' (Harriss); Arnawei Valley, 8,500' (Gatacre); Chitrál district (Younghusband, 1894).

*Circæa alpina*, L. Mirga, 7,000'—8,000' (Gatacre).

## CUCURBITACEÆ.

*Luffa echinata*, Roxb. Swat Valley, 3,000' (Gatacre).

*Cucumis Melo*, L. Chitrál district, 6,000' (Gatacre). Cultivated.

*Melothria heterophylla*, Cogn. (*Zehneria umbellata*, Thwaites), Drosh, 4,000'—5,000' (Hamilton).

## DATISCEACEÆ.

*Datisca cannabina*, L. Ashreth; Chitrál, 4,900' (Harriss); Kolundai, 5,800' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

## UMBELLIFERÆ.

*Eryngium cœruleum*, Bieb. Mian Kalai (Harriss).

*Vicatia conüfolia*, DC. Jambatai; Bundai (Harriss).

*Trachydium Roylei*, Lindl. Dorah Pass (Davidson).

*Bupleurum jucundum* Kurz., var. *cachemirica*. Mirga Valley, 7,000' (Gatacre).

*B. falcatum*, L. Mirga hills, 9,500'; Robat, 4,500' (Gatacre); Chitrál district (Younghusband, 1894).

*B. longicaule*, Wall. Zakhannah Valley, 6,000' (Gatacre).

*B. setaceum*, Fenzl Dir, 6,000' (Harriss).

\**B. sp.* (near *B. persicum*, Boiss). Broz 8,000'—9,000' (Harriss).

*Carum Bulbocastanum*, Koch. Jambatai, 5,000'—6,000'; Ziarat, 8,000'; Lowari Pass, 10,000'; Broz, 9,000' (Harriss); Ashreth Valley, 5,000' (Gatacre).

\* *Sium erectum*, Huds. (*S. angustifolium*, L.) Drosh, 4,000'—5,000' (Hamilton), Distrib.: Europe, Caucasus.

*Pimpinella diversifolia*, DC. Ziárat, 9,000' (Harriss); Arnawei Valley, 8,500' (Gatacre).

*P. Saxifraga*, L., var. *dissectifolia*. Arnawei Valley (Gatacre); Ziárat, 8,000' (Harriss).

*Chærophyllum reflexum*, Lindl. Mirga, 8,000' (Gatacre).

*C. villosum*, Wall. Gujar, 8,500'; Lowári Pass, 10,000' (Harriss).

*Scandix Pecten-Veneris*, L., var. *brevirostris*. Chitrál district (Younghusband, 1894) = Stocks No. 747.

*Anthriscus nemorosa*, Spreng. Ziárat, 7,500'; Lowári Pass, 9,000'; Gujar, 8,500' (Harriss).

*Seseli sibiricum*, Benth. Mirga, 9,200' (Gatacre).

*Prangos pabularia*, Lindl. Chitrál district, 7,000' (Harriss).

*Pleurospermum Candollii*, Benth. Lowári Pass, 11,000' (Harriss).

*Angelica glauca*, Edgew. Mirga, 7,000'—9,000' (Gatacre).

*Ferula Faeschkeana*, Vat Gujar, 9,000'—10,500'; Ziarat 7,500' to 9,000' (Harriss); Baraulley, 5,000' (Gatacre).

*Peucedanum Dana*, Buch-Ham. Bundai, 8,000' (Harriss); Swat Valley, 3,000' (Gatacre).

*Heracleum candicans*, Wall. Mirga, 7,000'—8,000' (Harriss) (Gatacre).

*Daucus Carota*, L. Mirga, 9,200' (Gatacre); Drosh, 4,000'—5,000'; Chitrál district (Hamilton).

*Caucalis Anthriscus*, Huds. Mirga; Chitrál, 4,900' (Harriss); Drosh, 4,000'—5,000' (Hamilton).

*C. latifolia*, L. Bundai, 4,000'; Dir (Harriss).

\* *C. Stocksiana*, Boiss. Bundai (Harriss), Distrib.: Persia, Baluchistan.

#### ARALICEÆ.

*Aralia cachemirica*, Dcne. Gujar Valley, 7,500'; Mirga, 7,200' (Gatacre).

*Hedera Helix*, L. Bundai, 4,000'; Jambatai, 5,500' (Harriss); Dir Valley, 5,000'; Mirga, 6,000'; below Laram Pass, 4,000' (Gatacre).

#### CAPRIFOLIACEÆ.

*Sambucus Ebulus*, L. Ziarat, 6,000'—7,000' (Harriss); Gujar Valley, 7,000'; Mirga, 8,000' (Gatacre).

*Viburnum cotinifolium*, D. Don. Jambatai, 6,000'; Ziarat 8,000' (Harriss); Ashreth Valley, 5,000'; Ziarat Valley, 9,000' (Gatacre).

*V. nervosum*, *D. Don.* Dir, 8,000'; Mirga, 7,000'—8,000' (Harriss).

*V. stellulatum*, *Wall.* Sharbat, 8,000' (Harriss).

*Abelia triflora*, *R. Br.* Dir, 8,000' (Harriss).

*Lonicera asperifolia*, *H. f. & T.* Chitral, 11,000' (Harriss).

\* *L. Griffithii*, *H. f. and T.* Ashreth Valley, 6,500' (Gatacre); Chitral district (Hamilton)., Distrib. : Afghanistan.

*L. purpurascens*, *Walp.* Lowari Pass, 10,500' (Harriss).

\* *L. Xylosteum*, *L.* Jambatai, 5,000'—6,000' (Harriss). Distrib. : Europe, Northern Asia.

#### RUBIACEÆ.

\* *Callipeltis Cucullaria*, *Stev.* Jambatai, 4,000'—5,000' (Harriss); Panjkora Valley, 4,000' (Gatacre). Distrib. : Afghanistan, Baluchistan, and westward to Mediterranean.

*Rubia cordifolia*, *L.* Panjkora Valley, 4,000' (Gatacre).

*Galium Aparine*, *L.* Jambatai, 5,000'; Dir, 5,000'; Broz, 9,000' (Harriss).

*G. boreale*, *L.* Lowari Pass, 8,000' (Harriss).

*G. triflorum*, *Michx.* Ziarat, 8,000' (Harriss); Ashreth Valley, 5,000' (Gatacre).

*Asperula cynanchica*, *L.* Ziárat, 7,200' (Harriss); Chitral district (Younghusband, 1894).

\* *A. setosa*, *Faub. and Spach.* Chitral 8,000' (Harriss), Distrib. : Persia, Syria.

#### VALERIANEÆ.

*Valeriana dioica*, *L.* Lowári Pass, 10,500' (Harriss); Mirga hills, 9,000' (Gatacre).

*V. Hardwickii*, *Wall., var. Hoffmeisteri.* Chitral district (Hamilton) (Younghusband, 1894).

*V. Wallichii*, *LC.* Jambatái, 6,000'; Bundai, 8,000'; Mirga, 8,000'; Lowári Pass, 10,500' (Harriss); Gujar Valley, 6,000' (Gatacre).

*V. dentata*, *Poll.* Bundai, 4,000' (Harriss); Baraul Valley, 7,000' (Gatacre).

*Valerianella Szovitsianum*, *F. and M.* Dir, 4,500' (Harriss).

#### DIPSACEÆ.

*Morina Coulteriana*, *Royle.* Lowari Pass, 10,000'—11,000' (Harriss); Mirga hills, 7,000—9,000' (Gatacre).

*Dipsacus strictus*, *D. Don.* Mirga, 7,500'—(Harriss); Gujar Valley 7,500' (Gatacre); Drosh, 4,000—5,000' (Hamilton).

*Scabiosa Candoliana*, *Wall.* Robat, 4,000' (Gatacre).

## COMPOSITÆ.

*Solidago Virgaurea*, L. Lowári Pass, 8,000—11,000'; Mirga, 7,000—8,000'; Zakhannah Valley, 6,000' (Gatacre); Drosh, 4,000—5,000' (Hamilton).

*Myriactis nepalensis*, Wall. Mirga, 8,000' (Gatacre). Chitral district (Younghusband, 1894).

*M. Wallichii*, Less. Mirga, 7,200' (Gatacre); Drosh, 4,000—5,000' (Hamilton).

*Aster altaicus*, Willd. Mian Kalai, Broz, 7,000' (Harriss); Choti-atán, 5,000' (Gatacre); Drosh, 4,000—5,000' (Hamilton); Chitral district (Younghusband, 1894).

*Erigeron alpinus*, L. Bundai 8,500' (Harriss); Arnawei Valley, 7,500'; Lowári Pass, 9,000—11,000' (Gatacre).

*E. alpinus*, L., var. *multicaulis*, Broz, 5,200' (Harriss); Mirga, 7,200'; Robat, 4,000'; Laram, 7,000' (Gatacre); Chitrál district (Younghusband, 1894).

*E. andryaloides*, Benth. Chitrál district, 11,000' (Harriss); Mirga, 8,500' (Gatacre).

*E. canadensis*, L. Jambatai, 4,000—5,000'; Bundai, 4,000'; Dir, 6,500'; Chitrál, 4,900' (Harriss); Arnawei Valley, 4,800'; Mirga, 7,700' (Gatacre); Drosh, 4,000—5,000' (Hamilton); Chitral district (Younghusband, 1894).

*E. monticolus*, Wall.—Mirga, 9,500'; Gujar, 8,000' (Harriss); Chitrál district (Younghusband, 1894).

*Conyza stricta*, Willd. Robat, 4,000' (Gatacre).

*Blumea Wightiana*, DC.—Bundai (Harriss).

*Filago germanica*, L.—Jambatai, 4,500' (Harriss).

*Leontopodium alpinum*, Cass.—Bundai, 8,300'; Gujar, 9,000'; Dir, 11,000' (Harriss); Lowári Pass, 11,000' (Gatacre).

*Anaphalis contorta*, Hook. f. Chitral district (Younghusband, 1894).

*A. cuneifolia*, Hook. f. Lowári Pass, 10,000—11,000' (Harriss) (Gatacre); Ziárat Valley, 7,000'; Mirga hills, 7,000—9,000' (Gatacre).

*A. Royleana*, DC. Mirga, 7,000—9,000' (Gatacre).

\* *Phagnalon acuminatum*, Boiss. Dir (Harriss); Ashreth Valley, 6,000' (Gatacre); Distrib.: Baluchistan.

*P. niveum*, Edgew. Broz, 5,200' (Harriss).

*Gnaphalium hypoleucum*, D C. Laram, 7,200' (Gatacre).

*G. luteo-album*, L., var. *multiceps*. Jambatai, 6,000'; Bundai (Harriss).

*G. luteo-album*, L., var. *pallidum*. Drosh, 4,500' (Harriss).

*Inula obtusifolia* Kerner, var *Clarkei*. Lowári range, 9,000' (Gatacre).

*Carpesium cernuum*, L. Drosh, 4,000—5,000' (Hamilton).

*Xanthium Strumarium*, L. Below Laram Pass, 4,000' (Gatacre).

*Siegesbeckia orientalis*, L. Drosh, 4,000'—5,000' (Hamilton); Chitral district (Younghusband, 1894).

*Bidens pilosa*, L. Laram, 7,000' (Gatacre), Drosh, 4,000'—5,000' (Hamilton).

*Tagetes erecta*, L. Below Laram Pass, 4,000' (Gatacre). Introduced.

*Achillea millefolium*, L. Lowári Pass, 7,000'—9,000' (Harriss); Gujar, 8,000' (Gatacre).

\* *A. pubescens*, L. (*A. micrantha*, Bieb.). Dir (Harriss), Distrib. Afghan, Persia, Songaria.

\* *Matricaria corymbifera*, D C Ziarat, 7,000'—9,000'; Broz, 8,500' (Harriss), Distrib.: Persia, Asia Minor.

*Artemisia laciniata*, Willd. Mirga, 7,500' (Gatacre).

*A. sacrorum*, Ledeb. Drosh, 4,500' (Harriss).

*A. scoparia*, W. & K. Gujar Valley, 5,000'; Darora, 5,000' Arnawei Valley (Gatacre); Chitrál district (Younghusband, 1894).

*A. vestita*, Wall.—Drosh, 5,000' (Harriss).

*A. vulgaris*, L. Ziárat, 7,500' (Harriss), Mirga, 7,000'—8,000' (Gatacre).

*Chrysanthemum Richteria*, Benth., var. Gilgit district. (Younghusband, 1894).

*Senecio chrysanthemoides*, D C. Ziárat, 8,000'; Mirga, 7,000'—9,000'; (Harriss); Gujar Valley, 7,500' (Gatacre).

*S. chrysanthemoides*, D C., var. Lowári Pass, 9,500' (Gatacre).

*S. coronopifolius*, Desf. Bundai; between Drosh and Guirat 4,500' (Harriss); Ziarat Valley, 6,000' (Gatacre).

\* *Cousinia buphthalmoides*, Regel, Drosh, 4,500' (Harriss), Distrib.: Afghanistan.

*C. microcarpa*, Boiss. Bundai (Harriss); Chitrál district (Younghusband, 1894).

\* *C. multiloba*, D C Chitrál district, 9,000—11,000' (Harriss); Distrib.: Persia.

*C. Thomsoni*, Clarke. Ziárat, 8,000' (Harriss); Mirga hills, 7,000'—9,000' (Gatacre).

*Carduus nutans*, L. Mirkandi, 6,000'; Bundai (Harriss).

*Cnicus argyranthus*, D C. Drosh, 4,800'; Chitrál, 4,900' (Harriss); Arnawei Valley, 7,000' (Gatacre).

*Saussurea albesecus*, H. f. & T. Gujar, 8,000'; Mirga, 7,000'—8,000'; Arnawei Valley, 4,800' (Gatacre).

*S. candicans*, Clarke. Jambatai, 4,000'; Drosh, 6,000' (Harriss).

\* *S. leptophylla*, Hemsl. Chitrál district (Younghusband, 1894) (Giles, Gilgit Expedition).

\* *S. n. sp.* Allied to *S. affinis*, Spreng., Ziárat, 7,000'—8,000' (Harriss).

*Tricholopis tibetica* H. f. & T. (*T. spartioides*, Clarke). Chitrál district (Younghusband, 1894).

*Zoegia purpurea*, Fresen., var. Ziárat, 7,500' (Harriss).

*Centaurea Calcitrapa*, L. Chitrál, 4,900' (Harriss) (Younghusband, 1894).

\* *Carbenia benedicta*, Adams. Dir Valley (Harriss). Distrib.: Persia, Caucasus, Mediterranean.

*Carthamus Oxyacantha*, Bieb. Mian Kalai (Harriss).

*Ainslia aptera*, D C. Bundai, 7,000' (Harriss); Mirga, 7,200' (Gatacre).

*Cichorium Intybus*, L. Chitrál, 4,900' (Harriss); Swat Valley, 3,000'; Dir Valley, 5,000' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*Lapsana communis*, L. Ziárat, 10,000' (Harriss).

*Picris hieracioides*, L. Dir, 5,600' (Harriss).

*Crepis japonica*, Benth. Bundai, 4,000'; Broz, 8,500' (Harriss); Ziárat Valley, 4,000'—7,000' (Gatacre).

*Pterotheca Falconeri*, Hk. f. Bundai, 4,000'; Gujar, 7,000'—10,000'; Lowári Pass, 9,000' (Harriss).

*Taraxacum officinale*, Wigg. Jambatai, 4,000'; Lowári Pass, 10,500' (Harriss).

*Chondrilla graminea*, M. Bieb. Drosh, 6,000' (Harriss).

*Lactuca dissecta*, D. Don. Jambatai, 6,000'; Bundai; Dir (Harriss).

*L. Heyneana*, D C. Ziárat Valley, 6,000' (Gatacre); Chitral district. (Younghusband, 1894).

*L. longifolia*, D C. Ziárat, 7,200'—8,000' (Harriss); Panakot, 5,000' (Gatacre).

*L. orientalis*, Boiss. Chitral district, (Younghusband, 1894).

\* *L. persica*, Boiss. Chitral district, 7,000' (Harriss). Distrib.: Baluch., Persia.

*L. Scariola*, L. Between Drosh and Guirat, 4,500' (Harriss); Arnawei Valley, 7,500' (Gatacre).

*Prenanthes Brunoniana*, Wall. Mirga, 8,000' (Gatacre).

*Sonchus asper*, Hill. Bundai, 4,000'; Dir, 6,000'; Drosh, 6,000' (Harriss).

*Tragopogon pratensis*, L. Broz, 7,500'—8,500' (Harriss); Chitrál district (Younghusband, 1894).

*Scorzonera divaricata*, Turcz. Ziarat, 7,200' (Harriss).

#### CAMPANULACEÆ.

*Codonopsis ovata*, Benth. Chitrál district (Younghusband, 1894).

*Sphenoclea zeylanica*, Gärtn. Swat Valley, 3,000' (Gatacre).

*Phyteuma Thomsoni*, Clarke. Dir, 7,000'; Gujar, 8,000' - 9,000' Ziarat, 9,000'; Lowári Pass, 10,000' (Harriss).

*Campanula cashmiriana*, Royle. Dir Valley, 6,000'; Mirga Hills, 8,000'; Lowári range, 6,000' (Gatacre).

*C. cashmiriana*, Royle, var. *evolvulacea*. Aranawei Valley; Mirga, 8,000'—9,000'; Lowari range, 12,000' (Gatacre).

*C. colorata*, Wall. Jambatai, 10,000'; Dir, 6,500'; Broz, 5,200'; Guirat, 4,500' (Harriss).

\* *C. Griffithii*, H. f. & T. Ashreth; Broz, 6,000'—8,000'; Chitrál, 4,900' (Harriss). Distrib.: Afghanistan.

#### ERICACEÆ.

\* *Rhododendron Collettianum*, Aitch. and Hemsl. Lowári Pass, 11,500' (Harriss); Zakhannah range, 13,500' (Gatacre) Distrib.: Afghanistan.

#### PLUMBAGINEÆ.

*Acantholimon lycopodioides*, Boiss. Chitrál district, 11,000' (Harriss).

\* *Statice Gilesii*, Hemsl. Gujar hills, 8,000' (Gatacre) (Giles, Gilgit Expedition).

\* *S. Griffithii*, Aitch. and Hemsl. Dir (Harriss); Panjkora Valley, 4,000' (Gatacre). Drosh, 4,000'—5,000' (Hamilton). Distrib.: Afghanistan.

#### PRIMULACEÆ.

*Primula denticulata*, Sm. Bundai, 7,000'—9,000'; Dir, 10,000'; Lowári Pass, 8,000'—10,000' (Harriss); Gujar Valley, 6,000'; Ashreth Valley (Gatacre).

*P. denticulata*, Sm., var. *erosioides*. Lowári Pass, 9,500' (Harriss).

*P. rosea*, Royle. Gujar, 8,000'—10,000' (Harriss). A variety with fewer and smaller flowers was collected in the Ashreth Valley, 5,200' (Gatacre); Broz, 5,200'; Chitrál, 4,900' (Harriss) (Younghusband, 1894).

*P. Stuartii*, Wall., var. *purpurea*. Lowári Pass, 11,500'—13,000' (Harriss), (Gatacre); Dorah Pass, 14,000'—15,000' (Davidson).

*Androsace foliosa*, Duby. (*S. sarmentosa*, Wall., var. *foliosa* of Fl., Br. Ind.) Mirga, 9,500' (Harriss); Ziarat Valley, 7,000'; Gujar Valley, 8,000' (Gatacre).

\* *Androsace Harrisii*, sp. n.

Perennial. Stems woody, much branched, lower naked portions concentrically leaf-scarred. Leaves imbricate, in compact squarrose rosettes terminating the branches, glabrous, ligulate, and somewhat boat-shaped,  $\frac{1}{2}$  inch long, acute and subspinulose, wider towards the base and with membranous edges, the younger ones pale green, lower chestnut-coloured changing to brown. Scapes about  $\frac{3}{4}$  inch long, solitary at the apex of the leaf rosettes, bearing umbels of 2-4 flowers, clothed with short crisp glandular hairs. Bracts 2—5, rather unequal, boat shaped, entire, hairy. Pedicels  $\frac{1}{8}$ — $\frac{1}{4}$  inch. Calyx densely glandular hairy, turbinate, a little shorter than the pedicels, segments rounded, imbricate, about one fourth the length of the tube, smooth inside. Corolla white,  $\frac{1}{2}$  inch in diameter; tube globose, membranous, equally the calyx; mouth constricted by a prominent ring; segments spatulate, spreading, emarginate. Stamens attached about half-way down the corolla tube, on very short filaments; anthers globose. Capsule turbinate, flat above; style  $\frac{3}{4}$  inch. Seeds 8, oval-oblong.

Above Ziarat, 11,000' (Harriss). A small woody shrub forming dense cushions. In habit it resembles *A. Tapete*, Maxim., from which it differs by the flowers being in umbels, the glabrous leaves, the spatulate corolla-lobes, and twice the number of seeds.

*A. rotundifolia*, Haraw, var. *glandulosa*. Jambatai (Harriss) Baraul Valley, 7,000' (Gatacre).

*A. rotundifolia*, Haraw, var. *macrocalyx*, Lowári Pass, 10,000' (Harriss); Laram, 7,000' (Gatacre).

*A. sempervivoides*, Jacquem., var. Ziarat, 10,000'; Lowári Pass, 10,500'; Gujar, 11,000' (Harriss).

*A. villosa*, L. Chitral district, 11,000' (Harriss); Dorah Pass, 14,000'—15,000' (Davidson).

*Cortusa Matthioli*, L. Lowári Pass, 10,500' (Harriss); Ashreth Valley, 6,000' (Gatacre).

*Lysimachia japonica*, Thumb. Dir (Harriss).

*Anagallis arvensis*, L. Gujar Valley, 6,000' (Gatacre).

*Samolus Valerandi*, L. Drosh, 4,000'—5,00' (Hamilton).

## MYRSINÆ.

*Myrsine africana*, L. Jambatai, 6,000' (Harriss).

*Replonia buxifolia*, A D C. Drosh, 4,500' (Harriss).

## EBENACEÆ.

*Diospyros Lotus*, L. Bundai (Harriss); Panjkora Valley, 4,000' (Gatacre).

## OLEACEÆ.

*Jasminum humile*, L. Jambatai, 5,000'—6,000' (Harriss).

*J. officinale*, L. Mirga (Harriss); Panakot, 5,000'; below Laram Pass, 4,000' (Gatacre).

*Syringa Emodi*, Wall. Ziárat 7,400' (Harriss).

*Fraxinus excelsior*, L. Jambatai, 4,500' (Harriss).

*F. floribunda*, Wall., var. Ashreth (Harriss). Leaves small, suborbicular.

*F. xanthoxyloides*, Wall. Mirkandi, 6,000' (Harriss).

*Olea cuspidata*, Wall. Drosh, 4,500' (Harriss); Swat valley, 3,000'; Darora, 5,000'; Arnawei valley, 4,800' (Gatacre); Serai, (Wingate).

## APOCYNACEÆ.

*Nerium odorum*, Soland. Mian Kalai (Harriss).

## ASCLEPIADACEÆ.

*Periploca aphylla*, Dcne. Drosh, 4,000'—5,000' (Harriss); Warai, 4,500'; Laram, 6,000' (Gatacre).

*Cynanchum acutum*, L. Drosh, 4,500' (Harriss); Zakhannah valley, 5,000' (Gatacre).

*C. Jacquemontiana*, Dcne. Gujar, 8,500'; Mirga, 9,000' (Harriss) (Gatacre).

## LOGANIACEÆ.

*Buddleia paniculata*, Wall. Jambatai (Harriss).

## GENTIANACEÆ.

*Gentiana argentea*, Royle. Bundai, 8,500' (Harriss).

*G. cachemirica*, Dcne. Lowári range, 13,000' (Gatacre)

*G. carinata*, Griseb., var. *marginata*. Lowári range, 11,000—12,000' (Harriss) (Gatacre).

*G. decumbens*, L. f. Ziárat valley, 5,000'—8,000'; Lowári range, 11,000' (Gatacre); Chitral district (Hamilton) (Younghusband, 1894).

*G. quadrifaria*, Blume. Chitral district (Younghusband, 1894).

*Faeschkea gentianoides*, Kurz. Zakannah Pass, 8,500' (Gatacre).

- Swertia cordata*, Wall. Laram, 7,000' (Gatacre).  
*S. petiolata*, Royle. Zakhannah valley, 6,000'; Ziárat valley;  
 9,000' (Gatacre).  
*S. speciosa*, Wall. Lowári Pass, 9,000' (Gatacre).

#### POLEMONIACEÆ.

- Polemonium cœruleum*, L. Ziárat, 10,000'; Lowári Pass, 9,000  
 (Harriss); Ashreth valley (Gatacre).

#### BORAGINEÆ.

- Heliotropium Eichwaldi*, Steud. Dir, 5,000'; between Guirat  
 and Chitral, 4,600' (Harriss).

- H. Eichwaldi* Steud, var. *lasiocarpum*. Sharbat, 4,000' (Harriss);  
 Arnawei valley (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

- Trichodesma indicum*, R. Br. Jambatai (Harriss).

- Cynoglossum lanceolatum*, Forsk. Chakdara (Harriss).

- C. microglochin*, Benth. Lowári Pass, 10,000' (Gatacre).

- C. Wallichii*, G. Don. Bundai, 4,000'; Ziárat 10,000' (Harriss),  
 Gujar Valley, 8,000'; Mirga, 7,000'—9,000'; Laram, 7,000' (Gatacre),  
 Drosh, 4,000'—5,000' (Hamilton).

- Lindelofia spectabilis*, Lehm. Arnawei Valley, 9,500' (Gatacre);

- Solenanthus circinatus*, Ledeb. Between Gujar and Ziárat,  
 8,000'—9,000' (Harriss).

- \* *Paracaryum asperum*, Stocks, Ashreth; Drosh, 8,000'; Chitral,  
 4,800' (Harriss). Distrib.: Baluch., Afghan., Gilgit.

- P. glochidiatum*, Benth. and Hk. f. Gujar, 7,500'; Mirga,  
 8,000' (Harriss); Ashreth, 7,000' (Gatacre).

- P. heliocarpum*, Kerner. Ziárat valley, 7,000'; Arnawei valley  
 (Gatacre).

- P. microcarpum*, Boiss. Jambatai, 4,000'—6,000'; Bundai, 4,000;  
 Dir; Mian Kalai (Harriss); Baraul valley, 5,000'; Ashreth valley  
 5,000' (Gatacre).

- Asperugo procumbens*, L. Ziárat, 7,500' (Harriss).

- Lycopsis arvensis*, L. Dir valley, 5,000' (Harriss).

- Mertensia primuloides*, Clarke. Dir, 11,000' (Harriss).

- M. tibetica*, Clarke. Lowári Pass, 10,000'—11,000' (Harriss);  
 Mirga, 7,000' (Gatacre).

- \* *M. n. sp.*, allied to *M. echioides*, Benth., Bundai, 8,000'  
 (Harriss) No. 16399; Dir, 11,000' (Harriss) No. 16397.

- Myosotis sylvatica*, Hoffm. Ziárat, 10,000'; Lowari Pass;  
 10,500'; Chitral district, 11,000' (Harriss); Mirga 8,000' (Gatacre).

- Lithospermum arvense*, L. Bundai, 4,000' (Harriss).

*L. tenuiflorum*, *L. f.* Chitral district (Younghusband, 1894).

*Moltkia parviflora*, *Clarke*. Dir, 11,000' (Harriss); Mirga, 9,200'; Zíárat valley, 5,000'—8,000'; Ashreth valley, 5,000' (Gatacre).

*Macrotomia perennis*, *Boiss.* Chitral district 11,000' (Harriss).

*Onosma echioides*, *L.* Between Guirat and Chitral, 4,700'; Chitral, 4,900'; Broz, 8,500' (Harriss); Dir Valley, 6,000'; Baraul Valley, 7,000' (Gatacre).

\* *O. stenosphon*, *Boiss.* Lowári range, 11,000' (Gatacre).  
Distrib.: Persia.

### CONVOLVULACEÆ.

*Ipomæa eriocarpa*, *R. Br.* Drosh, 4,000'—5,000' (Hamilton).

*I. hederacea*, *Jacq.* Swat Valley, 3,000' (Gatacre).

*Convolvulus arvensis*, *L.* Jambatai Pass; Dir; between Guirat and Chitrál, 4,800'; Chitrál, 4,900' (Harriss); Laram, 7,200' (Gatacre).

*Cuscuta capitata* *Roxb.* Guirat to Chitrál, 4,600' (Harriss).

*C. chinensis*, *Lamk?* Dir Valley (Harriss).

*C. europæa*, *L.* Mirkandi, 6,000' (Harriss).

*C. reflexa*, *Roxb.* Mirga, 6,000' (Gatacre).

### SOLANACEÆ.

*Solanum nigrum*, *L.* Broz, 5,200' (Harriss); Arnawei Valley (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*Datura Stramonium*, *L.* Bundai (Harriss); Darora, 5,000' (Gatacre).

*Physochlaina pæalta*, *Miers.* Gujar, 8,400' (Harriss); Mirga, 7,000'—8,000' (Gatacre).

*Hyoscyamus niger*, *L.* Bundai (Harriss).

### SCROPHULARINEÆ.

*Verbascum Thapsus*, *L.* Bundai; Mirga, 7,500' (Harriss); Gujar Valley, 5,000'—6,000'; Laram, 7,200'; Lowári Pass, 9,000' (Gatacre); Chitral dist. (Younghusband, 1894).

\* *V. erianthum*, *Benth.* Between Mirga and Dir, 6,000'; between Drosh and Guirat, 4,500' (Harriss); Arnawei Valley, 7,500' (Gatacre). Distrib.: Afghanistan.

\* *Linaria odora*, *Fisch.* Chitral dist. (Younghusband, 1894).  
Distrib.: Afghanistan to Europe.

*L. ramosissima*, *Wall*, *var. pubescens.* Drosh, 4,500' (Harriss).

\* *Scrophularia alata* *Gilib.* Mirga; Zíárat, 7,200' (Harriss); Zakhannah Pass, 9,000' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).  
Distrib.: Afghanistan and Persia to Europe.

\* *S. cabulica*, Benth. Jambatai, 10,000'; Chitral district, 10,000' (Harriss); Distrib.: Afghanistan.

*S. himalensis*, Koyle, Lowari Pass, 9,000' (Harriss).

*S. scabiosæfolia*, Benth. Mirga; Jambatai, 4,600'; Bundai 4,500'; Ziárat, 9,500'; (Harriss); Chitrál district (Hamilton).

*Mazus rugosus*, Lour. Jambatai, 10,000' (Harriss)

*Wulfenia Amherstiana*, Benth. Mirga hills, 8,000—9,000' (Gatacre).

*Veronica Anagallis*, L. Jambatai, 5,000—6,000'; Bundai, 4,000' (Harriss).

*V. Beccabunga*, L. Dir (Harriss); Mirga, 7,700' (Gatacre); Drosh, 4,000—5,000' (Hamilton); Chitral district (Younghusband).

*V. biloba*, L. Gujar, 9,000' (Harriss).

*V. deltigera*, Wall. Ziarat, 7,500'; Gujar, 8,400' (Harriss); Gujar Valley, 8,000'; Mirga hills, 8,000' (Gatacre).

*V. hederæfolia*, L. Bundai, 4,000' (Harriss).

*V. laxa*, Benth. Dir, 8,000' (Harriss).

*Leptorhabdos linifolia*, Walp. Mirga hills, 9,000'; Laram, 7,000' (Gatacre).

*Euphrasia officinalis*, L. Zakhannah Valley, 6,000' (Gatacre).

*Pedicularis bicornuta*, Klotzsch. Lowari Pass, 11,000—14,000' (Harriss), (Gatacre); Zakhannah Pass, 9,000' (Gatacre).

*P. pectinata*, Wall. Mirga, 7,400'; Arnawei Valley, 6,000'; Lowari range, 12,000'; Zakhannah Pass, 9,500' (Gatacre).

\* *P. pycnantha*, Boiss, var. *Semenovii*, Regel. Gujar, 8,000—10,000'; Chitral district. 11,000' (Harriss).

*P. tenuirostris*, Benth. Mirga, 7,400' (Gatacre).

*P. siphonantha*, D. Don., forma *Hookeriana*. Mian Kalai (Harriss); Lowari Pass, 9,000—10,000'; Zakhannah Pass, 10,800' (Gatacre).

#### OROBANCHACEÆ

*Orobanche Clarkei*, Hk. f. Chitral district, 9,000' (Harriss); Ziarat, 6,000' (Gatacre).

#### PEDALINEÆ.

*Sesamum indicum*, D C. Below Laram Pass, 4,000' (Gatacre). Cultivated.

#### ACANTHACEÆ.

*Strobilanthes alatus*, Nees. Between Mirga and Dir, 7,500'; Chakdara (Harriss); Mirga hills, 7,000—9,000'; Laram, 7,000' (Gatacre).

- Adhatoda vasica*, Nees. No locality given (Gatacre).  
*Dicliptera Roxburghiana*, Nees. Dir, 4,000'—6,000' (Harriss);  
 Panjkora Valley, 4,000' (Gatacre).

## VERBENACEÆ.

- Verbena officinalis*, L. Drosh, 4,000' Chakdara (Harriss); Robat, 4,000'; Laram, 7,000' (Gatacre).  
*Vitex Negundo*, L. Panjkora Valley (Harriss)

## LABIATÆ.

- Plectranthus Cætsa*, Buch-Ham. Laram, 7,000' (Gatacre).  
*P. rugosus*, Wall. Dir Valley, 5,000'; Broz, 5,200' (Harriss);  
 Zakhannah Valley, 6,000'; Gujar, 7,500'; Mirga, 8,000'; Warai, 4,500'  
 (Gatacre); Drosh, 4,000'—5,000' (Hamilton).  
*Elsholtzia densa*, Benth. Drosh, 4,000'—5,000' (Harriss).  
*Mentha sylvestris*, L., var. *incana*. Sharbat, 8,000; Drosh, 4,500' (Harriss); Robat, 4,000'; Arnawei Valley, 4,800' (Gatacre);  
 Chitral district (Younghusband, 1894).  
*M. sylvestris*, L., var. *Royleana*. Gujar Valley, 7,500'; Mirga, 7,700' (Gatacre); Chitral district (Younghusband 1894).  
*Lycopus europæus*, L. Drosh, 4,000'—5,000' (Hamilton).  
*Origanum vulgare*, L. Mirga hills, 7,000'—10,000'; Lowari Pass, 10,000' (Harriss).  
*O. vulgare*, L., var. *laxiflorum*. Dir, 5,000'—6,000'; Ziarat, 7,500 (Harriss); Panjkora Valley, 4,000' (Gatacre).  
*Thymus Serpyllum*, L. Jambatai; 5,000'—6,000'; Lowari Pass, 9,000—10,000'; Mirga Hills, 8,000'; Arnawei Valley, 7,500 (Gatacre).  
 \* *Zataria multiflora*, Boiss., var. *elutior*. Mirkandi, 6,000' (Harriss). Distrib.: Afghanistan.  
*Hyssopus officinalis*, L. Drosh, 4,000'—5,000' (Hamilton).  
*Micromeria biflora*, Benth. Jambatai, 5,000'—6,000'; Bundai. Dir; between. Guirat and Chitral. 4,600' (Harriss); Laram, 9,000, Mirga, 7,700' (Gatacre).  
*Calamintha Clinopodium*, Benth. Bundai, 4,000'; between Guirat and Chitral, 4,000'—5,000' (Harriss); Laram, 7,000' (Gatacre).  
*C. umbrosa*, F. & M. Gujar Valley, 6,500': Mirga, 7,000—9,000'; Laram, 7,000' (Gatacre).  
*Perovskia atriplicifolia*, Benth. Drosh, 4,000'—5,000' (Harriss) (Hamilton), Chitral Valley, 4,800' (Gatacre).  
*Salvia glutinosa*, L. Sharbat, 4,000' (Harriss); Gujar, 7,000; Ashreth, 5,000'; Mirga, 7,700' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*S. lanata*, Roxb. Laram, 7,000' (Gatacre).

*S. Moorcroftiana*, Wall. Jambatai, 5,000'—6,000'; Bundai, 4,000' (Harriss); Ashreth Valley, 7,000; Lowári range, 12,000—13,000; below Laram Pass, 4,000 (Gatacre).

*S. plebeia*, R. Br. Jambatai, 5,000'—6,000'; between Drosh and Guirat, 4,500' (Harriss).

\* *Zizophora clinopodioides*, Lamk. Drosh, 7,500'—8,000' Distrib. : Afghan. Beluch., Persia.

\* *Z. tenuior*, L. Bundai; between Guirat and Chitrál, 4,600' (Harriss). Distrib. : Afghan., Baluch., Persia, Siberia.

*Nepeta Cataria*, L. Guirat, 4,000'—5,000' (Harriss).

*N. Clarkei*, Hk. f. Ziarat, 7,200'; Lowári Pass, 9,500' (Harriss); Mirga, 7,000'—9,300'; Zakhannah Pass, 9,500' (Gatacre).

*N. connata*, Royle. Ziarat, 9,000' (Harriss).

*N. elliptica*, Royle. Robat, 4,500' (Gatacre).

*N. erecta*, Benth. Ziarat, 7,000' .10,000'; Lowári Pass, 10,000' (Harriss); Dir Valley, 5,000; Gujar Valley, 5,000; Mirga hills, 8,000' (Gatacre).

*N. Govaniana*, Benth. Mirga, 7,200' (Gatacre).

*N. juncea*, Benth. Broz, 5,200' (Harriss).

*N. nervosa*, Royle. Gujar Valley, 6,000'—8,000' (Gatacre).

\* *N. pinetorum*, Aitah and Hemsl. Mirkandi, 5,000'; Chitrál district, 9,000' (Harriss). Distrib. : Afghanistan.

\* *N. podostachys*, Benth. Ziarat, 7,500', Lowari Pass, 10,000' (Harriss); Chitral district (Younghusband, 1894). Distrib. : Afghanistan.

*N. raphanorrhiza*, Benth. Ziarat, 7,500'; Lowári Pass, 8,000—10,000' (Harriss); Chitral district, 8,000'—9,000' (Davidson).

Colonel Davidson (Commanding at Chitrál) informs me that the tubers of this plant are eaten raw by the people of the Chitrál hills, and that it is called by them "phaipuni". They are said to be very palatable when cooked. The plant is not uncommon on the inner ranges of the Western Himalaya and in Afghanistan.

*N. spicata*, Benth. Jambatai, 5,000' (Harriss); Mirga, 6,000—8,000' (Gatacre).

*N. spicata*, Benth. var. *elata*. Mirga, 8,000' (Gatacre).

*N. supina*, Stev. Dorah Pass, 14,000'—15,000' (Davidson).

*Dracocephalum nutans*, L. Ziarat, 10,000'; Lowári Pass, 10,000—11,000' (Harriss).

*Lallemantia Royleana*, Benth. Bundai (Harriss).

*Scutellaria linearis*, Benth. Panjkora (Harriss).

\* *S. multicaulis*, Boiss. Chitral district, 6,000' (Harriss) (Younghusband, 1894). Distrib.: Afghanistan, Persia.

*S. prostrata*, Jacq. Jambatai, 5,000'—6,000'; Bundai, 4,000'; Dir, 10,000'; Mirga (Harriss); Drosh 4,000'—5,000' (Hamilton).

*Prunella vulgaris*, L. Dir, 5,600'; Drosh, 4,500'; Chitral Valley, 4,700 (Harriss); Mirga, 7,500 (Gatacre).

*Marrubium vulgare*, L. Dir Valley, 6,000—7,000', Bundai; Ashreth; Drosh, 4,500'; Broz, 5,200' (Harriss).

*Anisomeles ovata*, R. Br. Below Laram Pass, 4,000' (Gatacre).

*Stachys floccosa*, Benth. Sharbat; Dir, 6,500'; Broz, 5,200 (Harriss).

*S. sericea*, Wall. Mirga, 7,000—10,000 (Harriss) (Gatacre); Lowari Pass, 9,000—10,000' (Harriss) (Gatacre); Gujar, 8,000' (Gatacre).

*Leonurus Cardiaca*, L. Mirga, 7,400'—8,000' (Gatacre.)

*L. Cardiaca*, L., var. *Royleana*. Ziarat, 7,500'; Gujar, 8,400'; Chitral, 8,000; (Harriss).

*Lamium album*, L. Mirga, 7,500'; Gujar, 8,000'; Ziarat, 8,000 (Harriss).

\* *Laghochilus, cabulicus* Benth. Chitral district, 9,000' (Harriss). Distrib.: Afghanistan, Persia.

*Leucas capitata*, Desf. (L. *Cephalotes*, Spreng.) Below Laram Pass, 4,000' (Gatacre).

\* *L. mollissima*, Wall., var. *scaberula*. Swat Valley, 3,000' (Gatacre). Distrib.: Central India and Khasia Mountains.

*Otostegia limbata*, Benth. Jambatai, 5,000'—6,000' (Harriss); below Laram Pass, 4,000' (Gatacre).

*Phlomis cashmiriana*, Royle. Broz., 8,000' (Harriss).

*P. bracteosa*, Royle. Ziarat, 9,000' (Harriss); Ashreth, 7,000' Gujar Valley, 6,500' (Gatacre).

*P. setigera*, Falc. Mirga, 7,000'—9,000' (Harriss) (Gatacre).

*P. spectabilis*, Falc. Between Mirga and Dir, 6,000'—7,000' (Harriss); below Laram Pass, 4,000'; Laram, 7,200'; Kashgaria, 5,000' (Gatacre).

\* *Eremostachys speciosa*, Rupr. Chitral district, 9,000' (Harriss) (Younghusband, 1894); Lowari range, 12,500' (Gatacre). Distrib.: Central Asia.

\* *Teucrium incanum*, Aitch. and Hemsl. Dir Valley, 4,500'; Drosh, 4,500' (Harriss); Robat, 4,000; Darora, 5,000' (Gatacre). Distrib.: Afghanistan.

*T. Royleanum*, Wall. Dir; Mirga; Drosh, 4,000'—5,000' (Harriss); Warai, 4,500' (Gatacre).

\* *T. serratum*, Benth. Mirkandi, 6,000' (Harriss); Drosh, 4,500' (Harriss), (Hamilton); Chitral district (Younghusband, 1894). Distrib.: Afghanistan.

*Ajuga bracteosa*, Benth. Jambatai, 5,000'—6,000'; Dir., 6,500' (Harriss); Panjkora Valley, 4,000' (Gatacre).

*A. parviflora*, Benth. Jambatai, 5,000'—6,000' (Harriss).

#### PLANTAGINEÆ.

*Plantago lanceolata*, L. Jambatai, 5,000'—6,000' (Harriss); Mirga, 7,700' (Gatacre).

#### NYCTAGINEÆ.

*Mirabilis Jalapa*, L. Between Mirga and Dir, 6,000' (Harriss); Dir Valley, 4,000'—5,000' (Gatacre).

*Boerhaavia repens*, L. Below Laram Pass, 4,000' (Gatacre).

#### ILLECEBRACEÆ.

*Herniaria hirsuta*, L. Jambatai, 6,200' (Harriss); Mirga, 7,500' (Harriss) (Gatacre).

#### AMARANTACEÆ.

*Celosia argentea*, L. Robat, 4,000' (Gatacre).

*Digera arvensis*, Forsk. Robat, 4,000' (Gatacre).

*Amaranthus Blitum*, L. Sharbat, 8,000' (Harriss); Mirga, 7,500' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

*A. paniculatus*, L. Sharbat, 8,000' (Harriss); Dir Valley, 4,200'; Mirga, 7,400'; Zakhannah Valley, 5,000' (Gatacre).

*Ærua tomentosa*, Lamk. Below Laram Pass, 4,000' (Gatacre).

*Achyranthes bidentata*, Blume. Kashgaria, 5,000' (Gatacre).

#### CHENOPODIACEÆ.

*Chenopodium album*, L. Drosh, 4,000'—5,000' (Hamilton).

*C. Blitum*, Hook. f. Dir, 6,000'; Zidfat, 7,500' (Harriss); Arnawei Valley, 8,500' (Gatacre); Chitral district (Younghusband, 1894).

*C. Botrys*, L. Mirkandi, 5,000' (Harriss); Mirga, 8,500' (Gatacre); Chitral district (Younghusband, 1894).

*C. murale*, L. Mirga, 7,700' (Gatacre).

*Atriplex crassifolia*, C. A. Mey. Mirkandi, 6,000' (Harriss).

#### POLYGONACEÆ.

*Polygonum affine*, D. Don. Lowári range, 10,000'—13,000' (Harriss) (Gatacre); Arnawei Valley, 9,500' (Gatacre).

*P. alatum*, Buch.-Ham. Mirga, 7,000'—8,000' (Harriss) (Gatacre).

*P. alpinum*, All. Chitral district (Younghusband, 1894).

*P. amplexicaule*, D. Don. Bundai, 4,000'; Lowári Pass, 10,000' (Harriss); Ashreth Valley, 6,000'; Mirga, 7,000'—9,000' (Gatacre).

*P. aviculare*, L. Drosh, 4,000'—5,000' (Hamilton).

*P. dumetorum*, L. Dir., 6,500' (Harriss); Dir Valley, 4,200' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

\* *P. Gilesii*, Hemsl. Jambatai, 10,000'; Chitrál, 6,000' (Harriss) (Giles, Gilgit Expedition).

*P. Hpdropiper*, L. Dir, 6,000'; Chakdara, (Harriss).

*P. laphathifolium*, L. Dir, 5,600' (Harriss).

*P. paronychioides*, C. A. Mey. Bundai; Ziárat, 7,500'; Lowári Pass, 9,000' (Harriss).

*P. plebeium*, R. Br. Bundai, 4,000' (Harriss); Baraul Valley, 7,000' (Gatacre).

*P. recumbens*, Royle. Lowári Pass, 10,000' (Harriss).

*P. rumicifolium*, Royle. Ziárat, 7,200'; Lowári Pass, 10,500' (Harriss); Mirga, 8,000'—9,000' (Gatacre).

*P. tubulosum*, Boiss. Mirga, 7,200' (Gatacre).

\* *Rheum Ribes*, L. Chitrál, 5,000'—9,000' (Harriss). Distrib.: Afghan., Persia, Syria.

*R. Webbianum*, Royle. Lowári Pass, 9,000' (Harriss).

*Oxyria digyna*, Hill. Lowári Pass, 10,000' (Harriss); Mirga, 7,200' (Gatacre).

*Rumex acetosa*, L. Lowári Pass, 9,500' (Harriss).

*R. dentatus*, L. Jambatai, 5,000'—6,000'; Mirkandi, 6,000' (Harriss).

*R. hastatus*, D. Don. Chashma; Bundai, 4,000'; Drosh, 4,500' (Harriss); Ashreth Valley, 5,000'; Arnawei Valley, 5,000'; below Laram Pass, 4,000'; Darora, 5,000' (Gatacre).

*R. nepalensis*, Spreng. Dir, 4,500' (Harriss); Mirga, 9,200' (Gatacre).

#### THYMELÆACEÆ.

*Daphne oleoides*, Schreb. Jambatai, 4,500'; Broz, 5,200'; between Gujrat and Chitrál, 4,500' (Harriss); Baraul Valley, 5,000'; Gujar Valley, 5,000'; Chitral district, 6,000' (Gatacre).

*Wikstrœmia canescens*, Meissn. Mirga, 7,000'—8,000' (Harriss) (Gatacre); Darora, 5,000' (Gatacre).

*Diarthron vesiculosum*, Endl. Dir, 6,000'; Mian Kalai; Gujrat; 4,500' (Harriss).

### ELÆAGNACEÆ.

*Elæagnus angustifolia*, L. Sharbat, 8,000' (Harriss).

*E. umbellata* Thunb., var. *parvifolia*. Zakhannah Valley, 5,000' (Gatacre).

### LORANTHACEÆ.

*Viscum album*, L. Panjkora valley, 4,000'; Laram, 7,000' (Gatacre).

*V. articulatum*, Burm. Sharbat (Harriss). On *Quercus* Ilex.

### SANTALACEÆ.

*Thesium divaricatum*, Jan. Lowari Pass, 10,000' (Harriss).

### EUPHORBIACEÆ.

*Euphorbia emodi*, Hook. f. Dir, 6,500'; Broz, 7,000' (Harriss); Panjkora Valley, 4,000' (Gatacre); Drosh, 4,000'—5,000' (Hamilton); Chitral district (Younghusband, 1894).

*E. falcata*, L. Dir, 6,500' (Harriss).

*E. helioscopia*, L. Jambatai, 5,000'—6,000' (Harriss).

*E. nypericifolia*, L. Panjkora (Harriss).

*E. pilosa*, L. Jambatai, 5,000—6,000'; Bundai, 7,000'—9,000' (Harriss); Ashreth Valley, 7,000'; Lowari Pass, 9,500' (Gatacre).

*Sarcococca pruniformis*, Lindl. Laram, 7,000' (Gatacre).

*Andrachne cordifolia*, Muell. Dir, 5,600' (Harriss); Kashgaria, 5,000' (Gatacre).

*Flueggia microcarpa*, Blume. Mirga, 7,400' (Gatacre).

*Chrozophora tinctoria*, A. Fuss. Between Broz and Guirat, 4,500' (Harriss); Warai, 4,500' (Gatacre); Drosh, 4,000'—5,000' (Hamilton).

### URTICACEÆ

*Ulmus Wallichii*, Flanch. Ziarat, 7,500' (Harriss).

*Celtis australis*, L. Jambatai, 6,000' (Harriss).

*Cannabis sativa*, L. Dir, 4,500'; Drosh, 4,500' (Harriss); Mirga, 7,700' (Gatacre); Chitral district (Younghusband, 1894).

*Morus alba*, L. Chitral, 4,900' (Harriss); Arnawei Valley, 4,000'—5,000' (Gatacre).

*Ficus foveolata*, Wall. Laram, 7,000 (Gatacre).

*F. palmata*, Forsk. Jambatai Pass; Dir, 4,500'; Chitral, 4,900' (Harriss).

*Urtica dioica*, L. Mirga, 8,000'; rear Drosh, 8,000' (Harriss).

*Parietaria judaica*, L. Ashreth; Dir, 6,500' (Harriss).

## PLATANACEÆ.

*Platanus orientalis*, L. Bundai, 4,000' (Harriss).

## JUGLANDEÆ.

*Juglans regia*, L. Jambatai, 4,500'; Ziárat, 7,500' (Harriss).

## CUPULIFERÆ.

*Alnus nepalensis*, D. Don. Swat Valley, 3,000' (Gatacre).

*Corylus Colurna*, L. Mirga, 7,000'—8,000' (Gatacre).

*Quercus dilatata*, Lindl. Jambatai, 6,500'; Ziarat, 7,500'—8,500' (Harriss).

*Q. Ilex*, L. Jambatai, 6,000' (Harriss); Mirga, 7,400' (Gatacre);

*Q. incana*, Roxb. Below Laram Pass, 4,000'; Laram 7,000' (Gatacre).

## SALICINEÆ.

*Salix babylonica*, L. Arnawei Valley, 4,500' (Gatacre).

*S. hastata*, L. Lowári Pass, 10,000'—11,000' (Harriss) (Gatacre).

*S. oxycarpa*, Anders. Ashreth (Harriss).

*S. Wallichiana*, Anders. Jambatai, 5,000'—6,000' (Harriss).

*Populus ciliata*, Wall. Ashreth (Harriss); Mirga, 7,200' (Gatacre).

## GENTACEÆ.

*Ephedra intermedia*, Schrenk. Mirkandi, 6,000'; Chitrál, 8,000' (Harriss).

## CONIFERÆ.

*Juniperus communis*, L. Above Jambatai, 10,000' (Harriss).

*J. macropoda*, Boiss. Ziárat, 11,000'; Chitrál, 9,500' (Harriss); Zakhannah range, 13,500' (Gatacre).

*J. recurva*, Buch:-Ham. Bundai, 9,600'; Dir, 11,000' (Harriss); Lowári Pass, 10,300' (Gatacre).

*Taxus baccata*, L. Mirga, 7,400' (Gatacre).

*Pinus excelsa*, Wall. Dir, 6,000' (Harriss); Mirga, 7,400' (Gatacre).

*P. Gerardiana*, Wall. Chitral district, 10,000'—11,000' (Harriss).

*Cedrus Libani*, Barrel, var. *Deodara*. Dir, 7,000' (Harriss); Mirga, 7,400' (Gatacre).

*Abies Webbiana*, Lindl. Dir, 8,000'—10,000' (Harriss).

*A. Webbiana*, Lindl., var., *Pindrow*. Mirga, 7,400' (Gatacre).

*Picea Morinda*, Link. Dir, 8,000'—10,000'; Gujar, 10,000' (Harriss).

## ORCHIDEÆ.

*Eulophia campestris*, Wall. Gujar-Valley, 6,000' (Gatacre).

*Neottia listeroides*, Lindl. Mirga, 9,200' (Gatacre).

*Spiranthes austriaca*, Lindl. Sharbat (Harriss).

*Epipactis consimilis*, Wall. Mirkandi, 6,000'—7,000' (Harriss).

*E. latifolia*, Swartz Jambatai, 6,500'; Dir, 11,000; Ashreth (Harriss).

*Orchis latifolia*, L. Lowári Pass, 9,500' (Harriss); Ashreth Valley, 6,000' (Gatacre).

*Herminium Duthiei*, Hook. f. Bundai, 4,000' (Harriss).

*Cypripedium cordigerum*, D. Don. Dir; Mirga, 9,500' (Harriss); Ziárat Valley, 8,000' (Gatacre).

## IRIDEÆ.

*Iris kashmiriana*, Baker. Chashma; Jambatai, 4,500' (Harriss).

*I. kumaonensis*, Wall. Gujar. 10,000'; Lowári Pass, 10,000'—11,500' (Harriss).

\* *I. songarica*, Schrenk. Chitral district 9,000'—11,000' (Harriss) (Younghusband, 1894) Distrib.: Afghanistan, Persia.

\* *Crocus Korolkowi*, Maw and Regel. Chitral district (Hamilton). Distrib.: Turkestan.

## AMARYLLIDEÆ.

\* *Ixiolirion montanum*, Herb. Lowári Pass, 10,000' (Gatacre); Chitral district (Hamilton) (Younghusband, 1894). Distrib.: Afghan., Persia, Syria.

## DIOSCOREACEÆ.

*Dioscorea deltoidea*, Wall. Bundai, 4,000'; Ziárat, 7,200' (Harriss); Mirga, 6,000'—7,200' (Gatacre).

## LILIACEÆ.

*Asparagus filicinus*, Buchi-Ham. Mirga forest, 9,500' (Gatacre).

*Polygonatum geminiflorum*, Dcne. Lowári Pass, 11,000' (Harriss); Ziárat Valley, 7,000' (Gatacre)

*P. multiflorum*, All. Jambatai, 6,000' (Harriss), Mirga, 8,800' (Gatacre).

*P. verticillatum*, All. Jambatai, 6,000' (Harriss); Mirga, 7,000'—9,000' (Harriss) (Gatacre).

*Hemerocallis fulva*, L. Dir, 5,000' (Harriss); Jandoul Valley, 4,000' (Gatacre). Introduced.

*Eremurus himalaicus*, Baker. Between Gujar and Ziárat,

7,000'—10,000' (Harriss); Lowári Pass; Arnawei Valley, 9,000' (Gatacre).

*Allium blandum*, Wall. Arnawei Valley, 8,500' (Gatacre).

*A. Govanianum*, Wall. Lowári Pass, 11,500' (Harriss).

\* *A. margaritaceum*, Sibth. and Smith, var. *S. scabrum*, Broz, 5,200' (Harriss). Distrib.: Persia, Europe.

*A. rubellum*, M. Bieb. Bundai, 4,000' (Harriss).

*A. rubellum*, M. Bieb., var. *grandiflorum*. Without locality (Gatacre).

*Lilium polyphyllum*, D. Don. Ziárat. 8,000'; Gujar, 8,400' (Harriss); Ashreth Valley, 5,000'—7,000'; Mirga Valley, 7,000'; Lowári range, 10,000'—11,000' (Gatacre).

*Fritillaria imperialis*, L. Chitrál district (Younghusband, 1894)

*Tulipa chrysantha*, Boiss. Chitrál district (Younghusband, 1894).

\* *T. Clusiana*, D. C. Chitrál district (Hamilton). Distrib.: Persia, Europe.

\* *T. dasystemon*, Regel. Chitrál district, 9,000' (Harriss) (Younghusband, 1894). Distrib.: Turkestan.

*L. stellata*, Hook. Gujar, 8,000'—9,000'; Ziárat, 8,000'—10,000' (Harriss); Lowári Pass, 10,000' (Gatacre).

\* *Gagea amblyopetala*, Boiss. and Heldr. Chitrál district (Younghusband, 1894). Distrib.: E. Europe

*G. fascicularis*, Salisb. (*G. lutea*, Schultz. f.) Dir, 11,000'; Bundai, 7,000'—9,300'; Lowári Pass, 9,000'—11,000' (Harriss); Ashreth Valley, 4,000'—7,000' (Gatacre); Chitrál district (Younghusband, 1894).

\* *G. filiformis*, Kunth. Chitrál district (Younghusband, 1894); Distrib.: Siberia.

*G. persica*, Boiss. Ziárat Valley, 4,500'—7,000' (Gatacre).

*Colchicum luteum*, Baker. Gujar, 8,500'—9,000' (Harriss); Lowári Pass, 10,000' (Gatacre).

*Merendera persica*, Boiss. Ziárat, 11,000' (Harriss); Chitrál district (Hamilton) (Younghusband, 1894).

\* *M. robusta*, Bunge. Gujar 8,500'—10,500'; Lowári Pass, 8,500'—11,000' (Harriss); Ashreth Valley, 5,000' (Gatacre). Distrib.: Turkestan.

*Trillium Govanianum*, Wall. Bundai, 9,000' (Harriss).

## JUNCACEÆ.

*Juncus glaucus*, Sibth. Broz, 7,500' (Harriss).

*J. himalensis*, Klotzsch. Ziárat, 9,000'; Lowári Pass, 10,000' Gujar, 8,400' (Harriss).

- J. lamprocarpus*, Ehrh. Bundai, 4,000' ; Chakdara (Harriss).  
*J. membranaceus*, Royle. Gujar 8,400' (Harriss) ; Chitral district (Younghusband, 1894).

## TYPHACEÆ.

- Typha angustata*, Chaub. and Bory. Mian Kalai (Harriss).

## AROIDÆ.

- Arum Jacquemontii*, Blume (*A. Griffithii*, Schott.). Ashreth (Harriss).

## ALISMACEÆ.

- Sagittaria guayanensis*, H. B. & K. Swat Valley, 3,000' (Gatacre).

- S. sagittifolia*, L. Munda, 3,000' ; Dir, 5,000' ; Mian Kalai (Harriss) ; Swat Valley, 3,000' (Gatacre).

## CYPERACEÆ.

- Pycnus capillaris*, Nees. Drosh, 4,000'—5,000' (Hamilton).

- Cyperus eleusinoides*, Kunth. Below Laram Pass, 4,000' (Gatacre).

- C. Eragrostis*, Vahl. Swat Valley, 3,000' (Gatacre).

- C. glaber*, L. Chakdara (Harriss).

- C. Iria*, L. Near Drosh, 4,000'—5,000' (Hamilton).

- C. rotundus*, L. Near Drosh, 4,000'—5,000' (Hamilton).

- Eleocharis palustris*, R. Br. Mirkandi, 6,000' ; Broz, 7,500' (Harriss).

- Fimbristylis dichotoma*, Vahl. Chakdara (Harriss) ; Robat, 4,000' ; Swat Valley, 3,000' (Gatacre).

- Eriophorum comosum*, Wall. Swat Valley, 3,000' (Gatacre).

- Kobresia capillifolia*, Dcne. Lowári Pass, 10,500' (Harriss).

- K. laxa* Benth. Broz, 7,500' (Harriss).

- Carex cardiolepis*, Nees. Bundai, 7,000' (Harriss).

- C. cruenta*, Nees. Lowári Pass, 9,500' (Harriss).

- C. flava*, L. Broz, 7,500' (Harriss).

- C. obscura*, Nees. Lowári Pass, 9,000' (Harriss).

- C. Wallichiana*, Prescott. Bundai, 4,000' (Harriss).

## GRAMINEÆ.

- Paspalum sanguinale*, Lamk. Chakdara, (Harriss) : Drosh, 4,000'—5,000' (Hamilton).

- Panicum Crus-galli*, L. Mian Kalai (Harriss) ; Drosh, 4,000'—5,000' (Hamilton).

- Setaria glauca*, Beauv. Arnawei Valley, 5,000' (Gatacre).  
*S. italica*, Beauv. Dir, 4,500'—6,500'; Chakdara (Harriss); Zakhannah Valley, 5,000'—6,000' (Gatacre). Cultivated.  
*Pennisetum lanatum* Klotzsch. Mirga, 7,200' (Gatacre).  
*P. orientale*, Rich. Chashma; Dir, 4,500'; Ashreth (Harriss), Chotiata, 5,000' (Gatacre).  
*Coix Lachryma-Jobi*, L. Swat Valley, 3,000' (Gatacre).  
*Zea Mays*, L. Arnawei Valley, 6,000'; below Laram. Pass, 4,000' (Gatacre).  
*Tragus racemosus*, Hall. Panjkora (Harriss).  
*Imperata arundinacea*, Cyr. Mirkandi, 6,000'; Broz, 5,200' (Harriss).  
*Saccharum spontaneum*, L. Below Laram Pass, 4,000' (Gatacre).  
*Erianthus Griffithii*, Hook. f. Below Laram Pass, 4,000' (Gatacre).  
*E. filiformis*, Nees. Dir, 4,500'—6,500' (Harriss).  
*E. Ravennæ*, Beauv, var. *purpurascens*. Drosh, 4,000'—5,000' (Hamilton).  
*E. Ravennæ*, Beauv. var. (approaching *E. Griffithii*). Guirat, 4,500' (Harriss).  
*Rottbællia speciosa*, Hack. Mirkandi, 6,500'; between Mirga and Dir, 6,000' (Harriss).  
*Ischæmum angustifolium*, Hack. Bundai; Panjkora (Harriss).  
*Andropogon Gryllus*, L., var. *echinulatus*. Mirga, 9,500' (Gatacre).  
*A. halepensis*, Brot. Chitrâl Valley, 4,000'—5,000' (Harriss).  
*A. Ischæmum*, L. Mirkandi, 6,000'; Sharbat, 8,000'; Panjkora (Harriss); Drosh, 4,000'—5,000' (Hamilton).  
*A. Iwarancusa*, Jones, subsp. *laniger* Desf. Dir; Mirkandi, 5,800' (Harriss); Warai, 4,500' (Gatacre).  
*A. monticola*, Schult., var. *Trinii*. Sharbat, 8,000' (Harriss).  
*Anthistiria anathera*, Nees. Chakdara (Harriss).  
*Apluda varia*, Hack, subsp. *aristata*. Below Laram Pass, 4,000' (Gatacre).  
*Aristida adscensionis*, L. Sharbat, 8,000' (Harriss).  
*A. cyanantha*, Nees. Drosh, 4,000'—5,000' (Harriss) (Hamilton).  
*Stipa barbata*, Desf. Jambatai, 10,000': Chitrâl 6,000' (Harriss).  
*S. Hookeri*, Stapf. Gujar, 9,000' (Harriss).  
*S. sibirica*, Lamk. Mirga, 7,400'—8,000'; Laram, 7,000' (Gatacre).  
*Oryzopsis Munroi*, Stapf. Bundai, 4,000'; Dir, 5,000'; Zírat, 7,000'—8,000' (Harriss).

- \* *O. pallida*, Stapf. M. S. Mirkandi, 5,500' (Harriss).  
*Pnleum arenarium*, L. Jambatai, 4,500'; Bundai (Harriss).  
*Agrostis alba*, L. Gujar, 8,400', Chakdara (Harriss).  
*A. subaristata*, Aitch. and Hemsl. Dir, 5,400' (Harriss).  
*A. verticillata*, Vill. Broz, 5,200' (Harriss).  
*Polypogon littoralis*, Smith. Bundai; Dir, 4,500' (Harriss).  
*P. maritimus*, Willd. Broz, 5,200'; Guirat, 4,500' (Harriss).  
*Calamagrostis littorea*, D.C. Mirga, 3,000' (Gatacre).  
*Cynodon Dactylon*, Pers. Bundai, 4,000' (Gatacre).  
*Chhoris villosa*, Pers. Mirkandi, 6,000'; Dir (Harriss); Ashreth Valley, 5,000' (Gatacre).  
*Pappophorum Aucheri*, Faub. & Spach. Guirat, 4,500' (Harriss).  
*Arundo Donax*, L. Mirkandi 6,000' (Harriss); Arnawei Valley, 4,000' (Gatacre).  
*Phragmites Roxburghii*, Kunth. Below Laram Pass, 4,000' (Gatacre).  
*Kæleria cristata*, Pers. Dir, 5,000' (Harriss).  
*Eragrostis cynosuroides*, Beauv. Mian Kalai (Harriss).  
*E. minor*, Host. Dir, 6,500'; Chakdara (Harriss); Dresh, 4,000'—5,000' (Hamilton); Chitral District. (Younghusband 1894).  
*E. pilosa*, Beauv. Chakdara (Harriss); Dresh, 4,000'—5,000' (Hamilton).  
\* *Diplachne Gatacrei*; Stapf. Warai, 4,500' (Gatacre).  
*Melica Cupani*, Guss., var. *brevisolia*, Boiss. Ziárat, 7,500'; Chitral district, 6,000'—11,000' (Harriss) (Younghusband, 1894).  
*Dactylis glomerata*, L. Mirga (Harriss).  
*Pogonatherum saccharoideum*, Beauv. Mirkandi, 6,000' (Harriss).  
*Poa bulbosa*, L., var. *vivipara*. Jambatai, 4,000' (Harriss).  
*P. nemoralis*, L., var. *ligulata*, Stapf. Bundai, 4,000'; Broz, 9,000' (Harriss); Mirga, 7,700' (Gatacre).  
*P. persica*, Trin., var. *soongarica*. Lowári Pass, 10,000' (Harriss).  
*P. pratensis*, L. Jambatai, 4,500' (Harriss).  
*P. pratensis* L., var. *vivipara*. Ziárat, 7,400' (Harriss).  
*Bromus patulus*, M. and K. Jambatai, 4,000'; Bundai (Harriss).  
*Brachypodium sylvaticum*, R. & S. Dir, 5,000'; Chakdara (Harriss).  
*Agropyron longe-aristatum*, Boiss. Gujar, 7,800' (Harriss).  
\* *Secale montanum*, Guss. Gujar, 7,800' (Harriss). Distrib.: Persia, Eastern and Southern Europe.  
*Hordeum murinum*, L. Chitral, 4,900' (Harriss).

## FILICES.

*Cystopteris fragilis*, Bernh. Jambatai, 5,000'—6,000'; Dir, 4,500'—10,000'; Ziarat, 10,000'; Lowari Pass, 8,500'—10,000'; Chitral District, 11,000' (Harriss); Mirga Hills, 8,000' (Gatacre).

*Adiantum Capillus-Veneris*, L. Jambatai, 5,500'; Dir, 4,000'—5,500'; Ashreth Valley, 6,000'; Chakdara (Harriss); below Laram Pass, 4,000'; Ziárat Valley, 6,000' (Gatacre); Drosh. 4,000'—5,000' (Hamilton).

*A. venustum*, D. Don. Dir, 5,000'; Jambatai (Harriss); Mirga, 8,000' (Gatacre)

*Cheilanthes fragrans*, Webb and Berth. Jambatai, 5,000'—6,000'; Dir., 4,500'; Sharbat (Harriss), below Laram Pass, 4,000'; Ashreth Valley (Gatacre)

*C. Szovitzii*, F. and M. Between Drosh and Guirat, 4,500' (Harriss); without locality (C. E. Pitman).

*Pellaea nitidula* Baker. Laram, 7,000' (Gatacre).

*Pteris aguilina*, L. Mirga (Harriss); Gujar Valley, 7,000' (Gatacre).

\* *P. cretica*, L., Dir., 6,500' (Harriss); Darora, 5,000'; below Laram Pass. 4,000' (Gatacre).

*P. longifolia*, L. Dir., 6,500' (Harriss); below Laram Pass, 4,000'; Mirga Hills, 8,000'.

*P. ludens*, Wall. Ziárat Valley, 5,000'—8,000' (Gatacre).

In reply to a letter to General Gatacre asking for further particulars regarding the localities of this very interesting fern, I received the following information:—"This fern was found growing in many places in the Ziárat Valley at 5,000 feet, near the Kaffir Rock,\* a well-known spot by reason of the Kaffirs from Kafiristán selecting this wild spot as the place to set upon and murder caravans passing through the country. The valley hereabouts is a very sheltered spot, a beautiful stream running down the centre, the hills clothed with flowering shrubs, and the valley filled with the white pæony. Undoubtedly snow lies here during winter, even down to 5,000 feet, but the place is warm and sheltered from wind; the soil is very rich, and streams from the summits of the hills are always pouring through fissures into the valley below. This fern was also seen growing in several places on the hill above on the west side of the valley, where water runs out of rocks at 8,000 feet. The ground here must be under snow for certainly four months, if not more. There is close by here a crater, apparently of volcanic origin.

\* The Kaffir Rock is about  $3\frac{1}{2}$  miles north of Lowari Pass, on the road.

which may account for the fern being found here, but no difference was perceptible in the temperature of the water."

*Asplenium Adiantum-nigrum*, L. Jambatai, 5,000'—6,000'; Dir Valley; Ziárat, 7,800' (Harriss); Panjkora, 4,000' (Gatacre).

*A. alternans*, Wall. Dir, 5,400'; between Drosh and Guirat, 4,500' (Harriss); below Laram Pass, 4,000' (Gatacre).

*A. Ceterach*, L. Panjkora Valley, 4,000'; Laram, 7,000'; Ashreth Valley, 5,000' (Gatacre).

*A. dentigerum*, Wall. Mirga, 8,500'; Lowári Pass, 10,000' (Harriss).

*A. fontanum*, Bernh. Mirga, 8,000' (Gatacre).

*A. Mackinnoni*, Hope. Gujar, 8,500'; Mirga (Harriss).

*A. septentrionale*, Hoffm. Ziárat, 7,200' (Harriss); Mirga forest, 9,500' (Gatacre).

*A. Trichomanes*, L. Jambatai, 5,000'; Bundai, 4,000'; Ashreth; Sharbat, 8,000' (Harriss); Mirga, 7,000'—9,500' (Gatacre).

*A. viride*, Huds. Lowári Pass, 11,000' (Harriss); Chitrál district (Younghusband, 1894)

*Aspidium Lonchitis*, Sw. Ziárat, 11,000'; Lowári Pass, 10,500' (Harriss).

*Nephrodium Filix-mas*, Rich. Lowári Pass, 9,500' (Harriss).

*N. molle*, Desr. Below Laram Pass, 4,000' (Gatacre)

*N. odontoloma*, Moore. (*Lastrea Filix-mas*, var. *odontoloma*, Moore in Bedd. Handb., Suppl. 55).—Jambatai, 5,000'—6,300'; Bundai; Dir., 8,000'; Ziárat, 7,500'—8,000'; Lowári Pass, 10,000'; Chakdára (Harriss).

*N. ramosum*, Hope. Gujar, 10,000'; Ziárat, 7,000'—9,000'; Mirga, 8,000' (Harriss); Laram, 7,200' (Gatacre).

*Polypodium Phegopteris*, L. Mirga, 9,500' (Harriss).

*P. Robertianum*, Hoffm. Mirga, 7,500' (Gatacre); Chitrál district (Younghusband, 1894).

*Lygodium microphyllum* R. Br. Ziárat Valley, 5,000' (Gatacre).

#### EQUISETACEÆ.

*Equisetum arvense*, L. Jambatai, Bundai, 4,000'; Ziárat, 7,200' (Harriss); Mirga 6,000'—8,000' (Gatacre).

*E. debile*, Roxb. Chakdara (Harriss): Drosh, 4,000'—5,000' (Hamilton).

#### LYCOPODIACEÆ.

*Selaginella rupestris*, Spring. Dir, 4,500'; Ashreth (Harriss); Mirga, 7,200' (Gatacre).

## MUSCI.

- Catharinea obtusula*, (C. Müll). Bundai, 8,000' (Harriss).  
*Mnium lycopodioides*, (Hook.) Schw. Jambatai, 4,000' (Harriss).  
*M. medium*, Br. Eur. Ziárat, 7,400' (Harriss).  
*M. riparium*, Mitt. Jambatai, 4,000' (Harriss).  
*Timmia bavarica*, Hessel. Mirga, 9,000'; Ziárat (Harriss).  
*Philonotis falcata*, Hook. Bundai, 4,000'; Dir, 4,000'; Mirga (Harriss).  
*Bartramia Ederi*, (Gunn) Sw. Mirga, 9,000' (Harriss).  
*Bryum argenteum*, L. Bundai, 4,000' (Harriss).  
*B. caespitium*, L. Ziárat, 7,400' (Harriss).  
*B. Schleicheri*, Schw. Lowári Pass, 10,000' (Harriss); Mirga, 7,700' (Gatacre).  
*B. turbinatum*, (Hedw.) Br. Eur. Ashreth, 5,000'—6,000'; Gujar, 9,000', Chitrál District, 8,000' (Harriss).  
*Pohlia cruda*, (L.) Lindb. Mirga, 9,000'; Ziárat, 9,000'; Broz, 7,000' (Harriss).  
*Funaria hygrometrica* (L.) Sibth. Bundai, 4,000'; Drosh, 8,000' (Harriss).  
*Tortula inermis*, (Brid.) Mont. Ashreth, 5,000'—6,000'; Bundai, 4,000' (Harriss).  
*T. montana* (Nees), Lindb. Ashreth, 5,000'—6,000' (Harriss).  
*Desmatodon latifolius* (Hedw.) Br. Eur. Gujar, 9,500' (Harriss).  
*Barbula alpigena*, Vent. Dir., 10,000' (Harriss).  
*B. rubella* (Hoffm) Mitt. Ziárat, 7,400'; Bundai, 8,000'; Dir, 10,000'; Gujar, 9,500' (Harriss).  
*Timmia anomala* (Br. Eur.) Bundai, 4,000'; Jambatai, 4,000'; Mirga, 9,000'; Dir Valley; Lowári Pass, 10,500'; between Guirat and Chitrál (Harriss).  
*Eucladium verticillatum* (L.), Br. Eur. Mirkandi, 6,000' (Harriss).  
*Amphidium lapponicum*, (Hedw.) Schimp. Mirga, 9,000'; Ashreth, 5,000'—6,000'; Ziárat, 10,000' (Harriss).  
*Drummondia Thomsoni*, Mitt. Dir Valley (Harriss).  
*Orthotrichum anomalum*. Hedw. Mirga; Lowári Pass, 10,000', Chakdara (Harriss).  
*Grimmia commutata*, Hüb. Mirga; Bundai, 8,000'; Lowári Pass, 10,500' (Harriss).  
*G. leucophæa*, Grev. Bundai, 8,000' (Harriss).  
*G. pulvinata*, (L.) Sw. Chakdara (Harriss).

*Amblystegium filicinum* (L.) Lindb. Bundai, 4,000'; Broz, 7,000' (Harriss).

*A. serpens* (L.), Br. Eur. Jambatai, 4,000'; Ashreth, 5,000—6,000'; Ziárat, 7,500'; Gujar, 9,000' (Harriss).

*Hypnum pseudoplumosum*, Brid. Jambatai, 4,000' (Harriss).

*H. rutabulum*, L. Ziárat, 7,400' (Harriss).

*H. salebrosum*, Hoffm. Mirga, 9,000'; Chitrál District, 9,000' (Harriss).

*H. strigosum*, Hoffm. Gujar, 9,500' (Harriss).

*Plagiothecium denticulatum*, (L.) Br. Eur. Ziárat, 7,400' (Harriss).

#### HEPATICÆ.

*Grimaldia dichotoma*. Jambatai, 6,000' (Harriss).

*Marchantia* sp. Bundai 4,000'—6,000' (Harriss).



# A BOTANICAL TOUR IN CHAMBA AND KANGRA.

By G. A. GAMMIE.

I left Saharanpur on the evening of the 13th August 1896 and arrived at Pathankote the following afternoon.

Pathankote stands on the verge of the undulating Siwalik tract which extends outwards from the precipitous southern slopes of the Dhaula Dhar, or first range of the Himalayas. The mountain valleys of the Ravi which are contained in the State of Chamba lie between this and the loftier second range, beyond which is Lahaul. As the area comprised between the first and second ranges is of great extent, I at once decided to confine my tours strictly within its limits. I first travelled through the western portion of the State as far as the Sach Pass and afterwards undertook the survey of the eastern side as far as Barmaor, from whence I proceeded to Kangra through Chanota and Kuarsi and over the Mharam Ghat Pass. Pathankote and its vicinity are well wooded, but many of the trees have certainly been planted, such as *Eugenia Jambolana*, *Acacia Catechu*, and *Ficus religiosa*, while *Adhatoda Vasica*, *Cassia Tora*, *Cannabis indica*, *Ricinus communis*, etc., are the principal components of the scrubby undergrowth. Although a distance of twenty-eight miles intervenes between Pathankote and Dunera, the trifling increase of altitude produces but little change worthy of especial remark in the vegetation. The commonest trees observed were *Pinus longifolia*, *Bombax malabaricum*, *Mallotus philippinensis*, *Terminalia tomentosa*, several species of *Acacia*; and there were good specimens of the Banyan and Pipal along the road at intervals. Grasses grew luxuriantly on many slopes which would have been bare and sterile but for their presence, and there were dense tracts of *Olea glandulifera*, *Adhatoda Vasica*, etc. The herbaceous flora was still that characteristic of the adjacent plains.

Leaving Dunera the road ascends steadily for twenty-two miles to Dalhousie; and towards the upper end oaks, rhododendrons, maples, horse-chestnuts and other trees form the humid forests, while the shrubby and herbaceous vegetation of a temperate climate replace at last the tropical forms left behind only a few miles lower down. *Desmodium tiliaefolium*, *Indigofera Gerardiana*, *Lespedeza sericea* give the locality a distinctive coloration from the profusion of their flowers, as do also those of humbler plants, such as *Geranium Anemone*, *Potentilla*, *Dipsacus*, *Aster*, *Cynoglossum*, *Bænnighausenia*, and many others.

A variety of ferns grow on shady banks in woods and along watercourses. *Polypodium lachnopus* and *P. lineare* thrive on the trunks and branches of trees and their occurrence draws the observer's attention to the fact that, excepting themselves, mosses and lichens, and occasionally mistletoe, other epiphytic and parasitical forms of vegetation are markedly absent from the flora of this region.

The third march was from Dalhousie to the town of Chamba, a distance of seventeen miles. For some miles the route runs at, and also above, the level of Dalhousie through magnificent forests of deodar and other conifers; and these forests, together with gigantic rocks and shady ravines, all yield an interesting series of plants. At Kajiär the conifers become rarer and a mixed growth of oaks, rhododendrons, laurels, maples, walnut, *Rhus*, etc., replace them. At a considerable distance lower down these woods come to an end and the remainder of the steep ascent is through cultivated slopes, consisting of fields of excellent maize, various millets, and *Amaranthus spinulosus*. The last with its ample red and yellow panicles brightens the landscape, and its fields of vivid hue serve to mark the positions of widely scattered hamlets among the valleys, miles away from the traveller's standpoint. The town of Chamba lies at an elevation of 3,000 feet above the sea, but many plants ascending to a similar height on the southern face of the range are absent here, while plants hitherto confined to higher levels descend to the banks of the Ravi on this side. A marked diminution of the rainfall, due to the interposition of the lofty southern range; and a milder summer climate and severer winter, depending on the proximity in almost all directions of enormous snowy mountains, must be the true causes for the decided change in the *facies* of the vegetation. Side by side with such distinctly tropical plants as *Bauhinia purpurea*, *Solanum verbascifolium*, *Ficus religiosa*, *Lippia nodiflora*, *Lantana crenulata*, *Vitex trifolia*, *Sapindus Mukorossi*, *Dalbergia Sissoo*, *Solanum xanthocarpum*, *Melia Azederach*, *Phyllanthus Urinaria*, *Lagerstrœmia indica*, *Adiantum caudatum*, *Heliotropium strigosum*, etc., may be found *Anemone vitifolia*, *Clematis grata*, *Thalictrum foliolosum*, *Origanum vulgare*, *Roylea elegans*, *Cotoneaster microphylla*, *Micromeria biflora*, *Astragalus chlorostachys*, *Platanus orientalis*, *Juglans regia*, *Pyrus armeniaca*, *Indigofera Gerardiana*, *Desmodium tiliaefolium*, and many others.

From Chamba I travelled on the western side as far as the Sach Pass which crosses the second range into Pangti. The first march was to Musroond. For some miles after leaving Chamba the road is

comparatively level and skirts the bank of the Ravi. *Olea cuspidata* seems to be the commonest small tree. *Zanthoxylum alatum*, *Zizyphus Jujuba*, *Adhatoda Vasica*, *Prinsepia utilis* are also abundant and a gaunt tree-like *Euphorbia* grows on the cliffs near the town. The path is shaded with good trees of *Celtis australis*, *Ficus palmata*, *Ficus religiosa*, and *Melia Azedarach*. *Mallotus phillippinensis* and *Dalbergia Sissoo* are common near the town, but do not extend far from it. There are also a few specimens of *Bombax malabaricum* and *Phœnix sylvestris* on the wide flats near the river. Good rice is grown on the irrigated level lands here, and the fields of Indian corn appeared to be exceedingly productive. *Ipomœa hederacea* beautifies the hedges with its bright blue flowers. The remaining part of the march was steep and in parts the vegetation very scanty. There are many small trees of *Pinus longifolia* and shrubs of *Berberis vulgaris* and *Plectranthus rugosus*. Looking out from the forest-house at Musroond one obtains a definite idea of the general scenery of this State. The view northwards is terminated by a line of snowy peaks. Towards the west is the deep valley of the Ravi bounded on the further bank by steep grass-clad mountains with broad terraces overlooking the river. In this, as in other parts of the Himalayas, the slopes facing southwards are steep and rocky, and bear trees only at widely scattered intervals, even the ravines being wanting in the dense thickets of shrubs and herbs which are so distinctive a feature in the side valleys and gullies of the northern ridges where, moreover, alone may be found extensive forests of conifers, oaks and other trees. Immediately under the lofty second range the radiating spurs are covered with forests in all directions. This, perhaps, may be due to a more liberal rainfall.

From Musroond the next march was to Kulel. The steep descent to the river below winds through an almost continuous stretch of cultivated land. The villages have to maintain a night-long clamour to warn off the black bears from the fields of ripening Indian corn which is the main crop at this season. The hillsides are usually so steep that the natives form their fields into broad terraces. This system must prevent the erosion of the shallow soil; moreover the walls of the terraces, often of considerable height, being covered with grass, a plentiful supply of good fodder must be furnished close to the homesteads of the people. Bees were seen issuing from many holes in the stone walls of the houses. I had no opportunity of tasting the honey, but it ought to be abundant and good in a country so well stocked with flowers. The road continues by a gradual ascent to Kulel

mostly through cultivated land. Here and there the shade cast by small willow groves assists to mitigate the intense heat experienced along the exposed paths. Everywhere Apricot and Walnut trees are carefully preserved. It was past the fruiting season of the former, but the latter bore fruits of excellent quality which were greedily consumed, fresh from the tree, by my native followers. At Kulel, a broad lateral valley, well wooded with pine trees, opens out towards the east; but the main valley continues in a northerly direction. The slopes of the latter are excessively steep, but are green with herbage. There are many good plants to be found around Kulel.

The next march was to Tisa, a village of importance judged by the standard of the country. There are three small rivers to be crossed on the way, and the flora along their courses is interesting. In one village we passed some trees of *Cratægus Oxyacantha*, cultivated for its fruit, which is of the size of a small plum and is considered palatable by the people. *Rubus ellipticus*, now in leaf only, is common enough to yield a moderate quantity of fruit. Taking into consideration that the climatic conditions of this State are, to all appearances, favourable to fruit culture, it is difficult to understand why its capability in this direction has not been encouraged and developed. The camping ground at Tisa is on a small flat above the bungalow, and a considerable portion of its area is shaded by a noble Poplar (*Populus ciliata*), the base of the stem of which is surrounded by a slate platform.

The succeeding march was to Alwas. After a short ascent above the village of Tisa the path crosses the ridge and strikes into a small Deodar forest. Lower down many groups of *Quercus dilatata* occur; this is an exceedingly common tree everywhere at this elevation. Further on there is a most interesting forest which descends to a river. *Marlea begoniæfolia*, *Parrottia Jacquemontiana*, *Ulmus campestris*, *Carpinus*, *Cæsalpinia sepiaria*, *Berchemia floribunda*, *Rosa moschata*, *Impatiens* of many species, and ferns in great variety are examples of the plants to be found here. Onwards the landscape again becomes bare and dreary, relieved sometimes by copses and village-lands. However, after descending to another river, the vegetation became more luxuriant and we gradually approach the pine forests which sweep upwards to the limit of trees. Purple and yellow Balsams are gregarious in moist ravines. *Pedicularis gracilis*, a yellow *Corydalis*, *Dispsacus inermis*, *Cnicus*, *Senecio*, *Polygonum*, *Potentilla*, and many other plants are abundant.

Above and around the camping ground at Alwas are dark pine

forests, and over all are towering rocky peaks with beds of snow descending their hollows. Thus far our journey had taken us among comparatively low mountains and ridges, with glimpses only of snowy ranges enclosing lateral valleys, but now the slopes ran upwards on all sides to elevations favouring the deposit of perpetual snow. From Alwas a short excursion was made through a valley to the westward. In the lower portion of this valley the trees are large and of varied aspect, consisting as they do of *Corylus Colurna*, *Quercus dilatata*, *Prunus Padus*, *Cedrus Deodara*, *Picea Morinda*, *Ulmus Wallichiana*, *Acer villosum*, and others. The shrubs are of equal interest and include (with many more) *Viburnum*, *Berberis*, *Desmodium tilæfolium* (which here attains its highest level), *Spiræa sorbifolia*, *Girardinia*, *Vitis*, etc. The density of the forest area prevents the growth of all but a few forms of herbaceous vegetation; but higher up, where the trees first become scattered and then disappear, small plants exist in great profusion. As examples of these may be cited *Parochetus*, *Impatiens*, *Ranunculus*, *Epilobium*, *Arctium*, *Malva*, *Polygonum*, *Fagopyrum*, *Heracleum* and other Umbelliferous plants, *Senecio*, *Cnicus*, *Urtica*, and several species of ferns.

A visit to the Sach Pass was undertaken on the following day. For some miles the road winds up through a forest of conifers, walnut, horse-chestnut, maple, oak, bird-cherry, etc. In several village clearances, Indian corn and *Amarantus paniculatus* are cultivated up to an elevation of 9,000 feet. *Quercus dilatata* attains this level but a little higher up it is replaced by *Q. semecarpifolia*. At first the latter is a tree of noble proportions rendered conspicuous by its reddish-brown foliage. Further on it gradually decreases in size until at, and also above, the limit of other trees, it is reduced to a gregarious shrub with sweeping branches. It forms dense copses appearing somewhat like *Rhododendron*-scrub in the distance. The forest tracts are at length succeeded by the open grassy slopes of the Alpine zone covered knee-deep with multitudes of herbaceous plants too numerous to mention here in detail; but the following genera named at random may serve as examples,—*Astragalus*, *Epilobium*, *Nepeta*, *Salvia*, *Delphinium*, *Lactuca*, *Sedum*, *Lychnis*, *Pedicularis*, *Swertia*, *Potentilla*, *Morina*, *Geranium*, *Corydalis*, *Erigeron*, *Saxifraga*, *Primula*, *Caltha*, *Meconopsis*, *Cynoglossum*. Standing in the midst of such a magnificent floral display my attention was drawn to a fact often already noted at the same altitude in other parts of the Himalayas. In the immediate vicinity the air blazed with the vivid hues possessed in such

perfection by Alpine flowers, while at a short distance and still more so on the adjacent slopes, the whole mass became resolved into a simple carpet of yellowish-green in which no other colour was apparent. One naturally anticipates that myriads of bright flowers borne above the level of the green herbage would give colour to scenery on every hand; but I have never found this to be really the case, and although so great a variety of coloration was everywhere around me, I could not but perceive that the general effect was that of a remarkable monotony, which, however, was redeemed in a measure by the grandeur of the culminating peaks of rocks and snow.

From Alwas I returned to Chamba. No fresh observations were made, but many plants, overlooked on the upward journey, were gathered. I remained at Chamba for three days to complete arrangements for making a tour through the eastern part of the State as far as Barmaor, from whence I purposed crossing over the first range to reach the district of Kangra. The first march terminated at a village named Rakh. This is the easiest walk in Chamba, as the road runs for twelve miles along the bank of the Ravi, and there are only slight ascents to be overcome. Large areas along the route were covered with Indian corn which was now ripe, and the villagers were busily employing themselves in collecting the produce which they expose for some time to sun and air on the roofs of their houses. The mountains on the right bank of the river are steep and rocky, and the tree-like *Euphorbia* is common. This plant seems to affect situations where it can remain in almost undisputed possession, under conditions unfavourable for the well-being of ordinary trees. The slopes on the left bank, also steep, are covered with grasses and various kinds of shrubs; behind them rise pine-clad hills. Soon after leaving Chamba two plane trees were passed. They were not good specimens. This tree is planted in various villages and I saw one of noble proportions in the Kangra Valley. Further on there was a rocky corner where many figs were found. I observed *Ficus clavata*, *Ficus hispida* and another which we were unable to reach. *Wendlendia puberula* was also collected here. Many tropical plants not seen during former marches were common in this one, such as *Buddleia asiatica*, *Plumbago zeylanica*, *Torenia cordifolia*, *Trema politoria*, *Lantana*, *Xanthium strumarium*, *Hibiscus pungens*, *Boehmeria platyphylla*, *Tephrosia purpurea*, *Amarantus spinosus*, etc. The rest-house at Rakh stands in a small wood of *Dalbergia Sissoo*.

The second march was to Chitrari. For some eight miles the road still runs comparatively level. The valley is exceedingly narrow

and the bounding mountains are rocky and bare. The prevailing vegetation remained of a sub-tropical type and presented few features worthy of remark. *Rubia cordifolia*, *Periploca calophylla*, *Daemia extensa*, *Cissampelos Pareira*, *Vitis lanata*, *Vitis parvifolia* were noted as climbers, while *Phagnalon niveum*, *Androsace rotundifolia*, *Athyrium pectinatum*, *Linaria ramosissima*, *Conyza stricta* were collected from the faces of cliffs. A steep ascent abruptly succeeded through a scrub composed principally of *Berberis*, *Plectranthus rugosus*, *Indigofera Gerardiana*, and *Desmodium tiliaefolium*. Near the end of the climb there was a spring of good water with a shady willow-tree close at hand. Beyond the top of the ascent we passed through a small Deodar forest and reached the village of Chitrari.

The third march was to Alwasa. This began with a long and steep descent to a river followed by a correspondingly laborious climb to the village of Koti. Between the river and up to a considerable elevation above Koti there are many villages and much cultivation. At the higher levels *Pinus excelsa* and Deodar are common. I anticipated finding many plants around the pass leading over to Alwasa, but I was disappointed in my expectation. The forests are good and extensive, but smaller vegetation was scanty in the extreme. The season had been abnormally dry, and probably the continued drought had prevented herbaceous plants from growing with their accustomed luxuriance. Below the pass a steep path winds through groups of Deodar and *Pinus excelsa*. From Alwasa a good view was obtained of the mountain range on the opposite side of the Ravi. The grass was drying up at lower elevations and there were few trees visible; upwards the prospect closed with enormous rocky cliffs capped with snow.

The fourth march was to Barmaor and it included a long descent and ascent. *Quercus dilatata* was abundant everywhere. Pine forests clothe considerable areas at Barmaor, and *Cupressus torulosa* is moderately common. A fine ash-tree grows at one end of the camping ground above the village. I saw the villagers engaged in preserving their winter supply of fodder by the identical method adopted in Kashmir, which is that the grass is first twisted into thick ropes and then hung about the branches of trees. There was a variety of plants growing on the sodden verges of the streams. After a stay of two days at Barmaor the journey to Kangra, over the Mharam Ghati Pass, was undertaken.

The first march was to Soai. After crossing the bridge at the foot of the long descent from the village of Kani the path turns

sharply to the left through dense thickets of oak. The long ascent to Soai follows, through woods of *Quercus dilatata*, *Q. Ilex*, *Q. lineata*, pines, deodar, horse-chestnut, walnut, etc. *Phytolacca acinosa* is common in these forests. The second march was to Chanota, and comprised alternating ascents and descents over bad paths. *Jasminum dispernum* and *Clematis* were common climbers; *Abelia triflora*, *Desmodium tiliæfolium*, *Plectranthus rugosus*, *Artemisia*, *Salvia Moorcroftiana*, *Cnicus*, *Erianthus Ravennæ*, *Erianthus fulva*, *Pennisetum*, *Andropogon* and many other plants were abundant. Large trees of *Alnus nepalensis* flourished near the banks of streams. The third march was to Kuarsi over an execrable native path which skirted the face of a precipice the greater part of the way. All our energies had to be devoted to the task of getting through without accident, so that few plants were collected. Here and there on jutting ridges we passed fine deodars which had grown very large in spite of these situations affording them such insecure-looking perches. The fourth march was to Ilas. It commenced with a steep ascent for a mile and a half through pine forests and fields of buckwheat and millets. Further on, as the steep rise which terminates in the peaks around the pass attains higher elevations, arboreal vegetation is left behind, and is replaced by dense thickets of willows and grassy flats full of herbs, which had, however, been browsed down by the sheep and goats. The fifth march was from Ilas to Laka above Dharmsala, by the Mharam Ghati Pass. A good variety of herbaceous vegetation straggled up close to the pass. For example there were *Saxifraga diversifolia*, *Corydalis*, *Pedicularis*, *Arenaria festucoides*, *Cyananthus lobatus*, *Tanacetum*, *Lactuca*, *Parnassia nubicola*, *Inula Royleana*, *Inula grandiflora*, *Sedum Ewersii*, *Lagotis*, *Athyrium thelypteroides*, *Cystopteris fragilis*, and many more. On the Kangra side of the pass there is a precipitous descent to Laka which we accomplished through blinding rain and sleet. On the following morning we marched to Dharmsala. A noble forest of *Quercus semecarpifolia* extends round Laka. The stems of these trees are covered thickly with mosses and they also support *Woodsia elongata* and *Davallia pulchra* in great quantity. This fact proved we had again entered a moister climate, for the last few marches in Chamba had been through forests but scantily furnished with epiphytes. Around the traveller's bungalow at Dharmsala the sub-tropical vegetation of the North-West Himalayas appears in great abundance.

The period allowed for the duration of my tour being almost exhausted, there was no time available for another extended

journey, I therefore decided to spend the last days on an excursion as far as Palampur, from whence I could return to Dharm-sala. All the level ground between Dharm-sala and Palampur is devoted almost exclusively to the culture of rice, and the fields are irrigated by an elaborate system of water channels. There are many streams pouring down from the lofty snowy range which rise abruptly behind these wide plateaux, water is therefore good and plentiful. The undulating ridges and knolls which crop up in every direction are covered with *Pinus longifolia* and *Quercus incana*. The small rivers have here cut wide and deep channels, and their banks proved good collecting grounds. The rice fields and water channels yielded a harvest of plants characteristic of wet cultivated land, such as *Sagittaria*, *Alisma*, *Nymphæa*, *Potamogeton*, *Marsilea*, *Eriocaulon*, *Veronica Anagallis*, *Epilobium*, *Jussiaea*, *Limnophila hypericifolia*, *Ranunculus*, *Cyperus*, *Polygonum*, *Ammannia*, *Monochoria*, *Floscopa*, *Coix*, and many others. On higher ground other types of vegetation were found, such as *Desmodium*, *Justicia*, *Adhatoda*, *Barleria*, *Hedyotis hispida*, *Smithia ciliata*, *Plectranthus*, *Scutellaria*, *Triumfetta*, *Crotalaria*, *Spermacoce*, *Osbeckia*, *Mimosa*, *Indigofera*, *Fasminum*, *Cassia*, *Phyllanthus*, *Nerium*, *Alysicarpus*, etc., *Cedrela*, *Sapium sebiferum*, *Sapindus Mukorossi*, and other trees are grown to shade the main roads. From Dharm-sala I travelled quickly to Pathankote and arrived at Saharanpur on the 1st of October.

I append a list of all the plants observed in Chamba and Kangra. Although very incomplete, it may serve to illustrate the Flora of these districts.

#### LIST OF PLANTS COLLECTED OR NOTED IN CHAMBA AND KANGRA.

##### *Ranunculaceæ.*

*Clematis montana*, Ham., *Clematis grata*, Wall., *Clematis connata*, DC., are common climbers.

*Anemone vitifolia*, Ham. Extends from the town of Chamba upwards to 10,000 feet. This was the only *Anemone* observed in flower during the tour.

*Thalictrum foliolosum*, DC., and various species not identified, ranged from 3,000 feet to 12,000 feet.

*Adonis* sp. at 12,000 feet, in fruit only.

There were indications of several species of *Ranunculus*, but none were in flower, excepting *R. sceleratus*, Linn., which grows in the irrigation channels of the rice fields in the Kangra Valley.

*Caltha palustris*, Linn., was seen in marshy places about 12,000 feet.

*Delphinium denudatum*, Wall., and *D. vestitum*, Wall., are common on sub-alpine slopes, as are also *Aconitum Napellus*, Linn. and *A. heterophyllum*, Wall.

#### *Magnoliaceæ.*

*Michelia Champaca*, Linn. Well-grown trees were observed near villages in the Kangra Valley up to 4,000 feet. It has no claim, however, to be considered a native of this region.

#### *Menispermaceæ.*

*Cocculus laurifolius*, DC. A small tree which scarcely ascends above 3,000 feet in Chamba.

*Cissampelos Pareira*, Linn. A common climber growing over shrubs and small trees at moderate elevations

*Stephania elegans*, Hook. f. and T. A small climber seen at 6,000 feet.

#### *Berberideæ.*

*Berberis vulgaris*, Linn., *Berberis aristata*, DC., *Berberis Lycium*, Royle, are all more or less common.

*Podophyllum Emodi*, Wall. Plants of this were found in ripe fruit between 10,000 and 14,000 feet below the Sach Pass.

#### *Nympeaceæ.*

*Nelumbium speciosum*, Willd., grows in the tank in the Rajah's garden at Chamba. I saw no other place with suitable conditions for its growth. *Lemna* covered the water in the same tank.

Leaves of *Nymphæa* sp. were seen in ponds and rice-fields in Kangra Valley.

#### *Papaveraceæ.*

*Merionopsis aculeata*, Royle, is common in shady situations between 10,000 and 15,000 feet.

#### *Fumariaceæ.*

Various species of *Corydalis*, ranging from 5,000 feet to the upper limits of vegetation.

#### *Cruciferæ.*

I collected *Capsella Bursa-pastoris*, Mœnch., and a few other species not identified. At the time of my visit examples of this order were conspicuous by their absence.

*Capparideæ*

*Cleome viscosa*, Linn., is common in fields and waste places at moderate elevations.

*Capparis spinosa*, Linn. This is a shrub which usually grows on the driest rocks exposed to the fierce sun-light. The branches hang downwards, and the flowers are large and strikingly handsome with white petals and purple filaments.

*Violaceæ.*

*Viola biflora*, Linn., *V. Patrinii*, DC., *V. serpens*, Wall., are common throughout Chamba.

*Polygalæ.*

*Polygala crotalaroides*, Ham., a dense dwarf shrub with dark red flowers; *P. abyssinica*, Fresen., bearing long racemes of light pink flowers; *P. persicariæfolia*, DC., *P. chinensis*, Linn., *P. sibirica*, Linn., *Salamonia* sp. are all abundant on road-sides and sandy banks at the lower levels.

*Caryophyllæ.*

*Gypsophila*; *Silene inflata*, Smith; *S. Falconeriana*, Benth., and other species; *Cucubalus bacciferus*, Linn.; *Lychnis indica*, Benth.; *L. pilosa*, Edgew., and other species; *Cerastium*; *Stellaria*; *Arenaria*; *Sagina*; *Drymaria cordata*, Willd. Examples of the foregoing are abundant and are distributed throughout the zones of vegetation.

*Hypericineæ.*

*Hypericum patulum*, Thunb., *H. perforatum*, Linn., *H. elodoides*, Choisy. The two last are extremely common and extend to 8,000 feet and perhaps higher.

*Ternstræmiaceæ.*

*Camellia theifera*, Griff., is extensively cultivated in the Kangra Valley. There are no indigenous representatives of this order.

*Malvaceæ.*

*Malva verticillata*, Linn., *M. silvestris*, Linn., *M. rotundifolia* Linn., are three herbs more or less common from 3,000 to 10,000 feet.

*Sida humilis*, Willd., *S. spinosa*, Linn., *S. rhombifolia*, Linn., *S. cordifolia*, Linn., *Abutilon indicum*, G. Don., *Urena lobata*,

Linn., and *Hibiscus pungens*, Roxb., are all met with in the warmer valleys.

*Hibiscus cannabinus*, Linn., is cultivated up to 5,000 feet.

*Gossypium herbaceum*, Linn., is also cultivated.

*Bombax malabaricum*, DC. There are a few good trees of this in the vicinity of the town of Chamba, but it does not extend upwards beyond 3,000 feet.

#### *Tiliaceæ.*

*Grewia oppositifolia*, Roxb. A small tree, occurring up to 7,000 feet, found near villages where it is probably preserved for the sake of its fruit.

*Triumfetta pilosa* Roth., and *T. rhomboidea*, Jacq., are common on banks and waste places at low levels.

*Corchorus trilocularis*, Linn., and *C. acutangulus*, Lam., are frequently seen in fields of maize, etc.

#### *Linææ.*

*Reinwardtia trigyna*, Planch., is a very common undershrub on sunny slopes up to 6,000 feet.

#### *Zygophyllææ.*

*Tribulus terrestris*, Linn., grows prostrate in pastures at low elevations.

#### *Geraniaceæ.*

*Geranium Wallichianum*, Sweet., *G. nepalense*, Sweet., and a few other species are all characteristic plants of the upper forests but are also to be seen in suitable localities much lower.

*Oxalis corniculata*, Linn., is a creeping weed in sandy spots up to 5,000 feet.

*Impatiens Balsamina*, Linn., *I. Thomsoni*, Hook. f., *I. sulcata* Wall., *I. scabrida*, DC., *I. amphorata*, Edgew., and many others, grow gregariously in moist shady ravines.

#### *Rutaceæ.*

*Bœninghausenia albiflora*, Reichb., is an herb with white flowers ranging upwards to 8,000 feet.

*Zanthoxylum alatum*, Roxb. Is a small thorny tree, very fetid when bruised. It is abundant on the slopes running down to the banks of the Ravi at 3,000 to 5,000 feet.

*Skimmia Laureola*. Hook. f., is a common undershrub of the upper forests.

*Meliaceæ.*

*Melia Asadirachta*, Linn., and *M. Azedarach*, Linn., are trees cultivated in low hot valleys.

*Cedrela serrata*, Royle. This is a tall leafy tree with smooth dark-coloured capsules and attains an elevation of about 5,000 feet.

*Ilicineæ.*

*Ilex dipyræna*, Wall., is a tree associated with oaks, maples, etc., at 8,000 to 9,000 feet.

*Celastrineæ.*

*Euonymus Hamiltonianus*, Wall. Grows at moderate elevations.

*Rhamnææ.*

*Zizyphus Jujuba*, Lam., is a common shrub or small tree at low elevations.

*Zizyphus vulgaris*, Lam., is a tree cultivated near villages up to 6,000 feet. Its fruit is palatable and is largely eaten by the natives.

*Berchemia floribunda*, Wall., is a climber observed only at about 5,000 feet.

*Rhamnus davuricus*, Pallas, and *R. purpureus*, Edgew., are common shrubs ascending to 9,000 feet.

*Sageretia theezans*, Brogn., is a rigid, spinose, leafy shrub, plentiful at 5,000 feet.

*Ampelidææ.*

*Vitis lanata*, Roxb., is a large climber covering small trees with its reddish leaves. It is abundant near the town of Chamba and occurs in many localities.

*Vitis vinifera*, Linn. Is cultivated at low elevations, but was not often observed.

*Vitis parvifolia*, Roxb., and *V. himalayana*, Brandis, are common up to 8,000 feet.

*Sapindaceæ.*

*Cardiospermum Halicacabum*, Linn., is a small, tender climber found on fences round fields.

*Æsculus indica*, Colebr., is a very common large tree ranging from 3,000 to 10,000 feet. The exfoliated bark hanging in long loose stripes on the trunk gives a distinctive character to the tree.

*Sapindus Mukorossi*, Gært., is cultivated in the town of Chamba and in the Kangra Valley ; is planted as a road-side tree.

*Acer oblongum*, Wall., *A. cæsium*, Wall., *A. caudatum*, Wall., and *A. pictum*, Thunb., are components of the upper forests.

*Anacardiaceæ.*

*Rhus Cotinus*, Linn., is a large shrub common in many places but most abundantly seen about 5,000 feet.

*Rhus semi-alata*, Murray. A small tree, with fruits covered with a white acid secretion, seen in forests from 000 to 6,000 feet.

*Rhus succedanea*, Linn., is common about 4,000 feet.

*Mangifera indica*, Linn., is not seen in Chamba, but there are many fine trees in the Kangra Valley.

*Coriariæ.*

*Coriaria nepalensis*, Wall., extends as high as 6,000 feet.

*Leguminosæ.*

*Argyrolobium flaccidum*, Spach., is a prostrate bush, most frequent in hot valleys.

*Crotalaria prostrata*, Roxb., *C. mysorensis*, Roth., *C. albida*, Heyne, *C. medicaginea*, Lam., are all frequent at low levels.

*Trifolium pratense*, Linn., and *T. repens*, Linn., grow in pastures from 5,000 feet upwards.

*Parochetus communis*, Hamilt., is a herb covering banks in moist ravines.

*Indigofera linifolia*, Retz., *I. trifoliata*, Linn., *I. hirsuta*, Linn., and other species occur in warm localities.

*Indigofera Gerardiana*, Wall., with its variety *heterantha*, are abundant small shrubs with a wide range of altitudinal distribution. *I. hebeptala*, Benth., is almost equally common.

*Tephrosia purpurea*, Pers., is frequent at low elevations.

*Astragalus* is represented by many species mostly at high levels.

*Lespedeza eriocarpa*, DC., abounds at 7,000 feet.

*Zornia diphylla*, Pers., was collected in Kangra Valley.

*Smithia ciliata*, Royle, is common on dry banks.

*Æschynomene indica*, Linn., grows in wet places up to 5,000 feet. In the submerged rice-fields in Kangra many plants of this were seen to form thick pithy stems between the roots and upper surface of the water.

*Uraria picta*, Desv., *U. lagopus*, DC., are found in warm valleys, as are also *Alysicarpus vaginalis*, DC., *A. bupleurifolius*, DC., *A. rugosus*, DC.,

*Desmodium triquetrum*, DC., *D. laxiflorum*, DC., *D. podocar-*

*pum*, DC. *D. floribundum*, G. Don, *D. tiliaefolium*, G. Don., *D. concinnum* DC., *D. polycarpum*, DC., *D. triflorum*, DC., *D. parvifolium*, DC., and *D. gyrans*, DC., are all common. *Desmodium tiliaefolium*, G. Don., and its variety *argenteum*, are two of the commonest and most widely distributed shrubs in Chamba, and they extend from the lowest level to 9,000 feet.

*Vicia pallida*, Turcz., is a climber of warm tracts.

*Phaseolus calcaratus*, Roxb., grows at low elevations.

*Vigna vexillata*, Benth., with large purple flowers, is a characteristic small climber on grassy slopes exposed to the sun.

*Dolichos Lablab*, Linn., is cultivated.

*Rhynchosia sericea*, Spanoghe, and *R. himalensis*, DC., are climbers common about 6,000 feet.

*Flemingia strobilifera*, R. Br., was seen only in Kangra Valley.

*Flemingia congesta*, Roxb., var. *semialata*, does not ascend above the lowest levels of the banks of Ravi.

*Dalbergia Sissoo*, Roxb., is frequent near the town of Chamba, but does not grow above 3,500 feet.

*Sophora mollis*, Grah., is a common shrub at low elevations.

*Cæsalpinia sepiaria*, Roxb., is a large climber rarely seen about 5,000 feet.

*Cassia occidentalis*, Linn., *Cassia Tora*, Linn., *Cassia Absus*, Linn., *Cassia mimosoides*, Linn., are all common at low elevations.

*Bauhinia Vahlia*, W. and A., was seen only in Kangra Valley.

*Bauhinia purpurea*, Linn., is cultivated only about the town of Chamba.

*Mimosa rubricaulis*, Lam., is a small thorny shrub of low levels.

*Albizzia Julibrissin*, Durazz, was frequently met with about 5,000 feet.

#### *Rosaceæ.*

*Prunus persica*, Benth. and Hook. f., is cultivated.

*Prunus armeniaca*, Linn., is cultivated everywhere and is one of the commonest trees near villages.

*Prunus communis*, Huds., variety *insititia*, is cultivated.

*Prunus Padus*, Linn., is a common tree, particularly in the forests from 7,000 to 12,000 feet.

*Prinsepia utilis*, Royle, is an abundant shrub often utilized to make hedges.

*Spiræa vestita*, Wall., grows in the upper forests.

*Spiræa sorbifolia*, Linn., is a large handsome shrub plentiful about 8,000 feet.

*Spiræa canescens*, Don., is a dense shrub found between 5,000 and 12,000 feet.

*Spiræa parvifolia*, Bert., was seldom observed and appears to be a rare plant.

*Rubus paniculatus*, Smith, was noted in several ravines below 6,000 feet.

*Rubus niveus*, Wall., is common up to 6,000 feet; *R. ellipticus*, Smith, and *R. lasiocarpus*, Smith, are plentiful up to 6,000 feet.

*Geum urbanum*, Linn., is abundant in forests from 5,000 to 12,000 feet.

*Geum elatum*, Wall., grows from 9,000 to 12,000 feet.

*Fragaria indica*, Andr., is a plant of warm valleys.

*Fragaria vesca*, Linn., is common from 5,000 to 10,000 feet.

*Potentilla Sibbaldi*, Haller f., *P. nepalensis*, Hook., *P. argyrophylla*, Wall., and a few more of the same genus are most common at the higher levels.

*Agrimonia Eupatorium*, Linn., and *A. pilosa*, Ledeb., are two closely allied species. The former has a wider range than the latter which is most frequent about 7,000 to 8,000 feet.

*Rosa macrophylla*, Ldl., was seen on rocky slopes about 10,000 feet.

*Rosa moschata*, Mill., is a large climber abundant everywhere from 3,000 to 9,000 feet.

*Cydonia vulgaris*, Pers., is cultivated, as is also *Pyrus Malus*, Linn.

*Pyrus baccata*, Linn., is one of the commonest trees in Chamba.

*Pyrus communis*, Linn., is cultivated.

*Pyrus lanata*, Don., is a tree of the upper forests.

*Cræægus Oxyacantha*, Linn., was not seen in a wild state, but I noted cultivated trees with palatable, plum-like fruits.

*Cotoneaster bacillaris*, Wall., is common.

*Cotoneaster microphylla*, Wall., is a low dense shrub common everywhere at almost every elevation.

#### *Saxifragaceæ.*

*Astilbivularis*, Ham., is a denizen of humid forests.

*Saxifraga diversifolia*, Wall., is abundant at high levels.

*Saxifraga lingulata*, Wall., is common on rocks. There are other species of this genus, but these were the only examples found in flower or fruit.

*Parnassia nubicola*, Wall., and *P. ovata*, Ledeb., are common at high levels.

*Hydrangea altissima*, Wall., is a climbing shrub observed only in one locality at about 5,000 feet.

*Deutzia corymbosa*, Br., and *D. staminea*, Br., are found at the higher elevations.

*Ribes*. I do not recollect seeing any examples of this genus, but it must certainly be represented.

#### *Crassulaceæ.*

*Tillæa pentandra*, Royle, grows on rocks at 6,000 feet and upwards. It is common below Laka, near Dharmsala.

*Crassula indica*, Dcne., also grows on rocks.

*Kalanchæ spathulata*, DC., is found at low elevations only and in dry places.

*Sedum Rhodiola*, DC., *S. quadrifidum*, Pall., *S. asiaticum*, DC., *S. trifidum*, Wall., *S. rosulatum*, Edgew., *S. Ewersii*, Ledeb., *S. multicaule*, Wall., and probably others, are all common.

#### *Hamamelidæ.*

*Parrottia Jacquemontiana*, Dcne. A shrub or small tree, gregarious where it occurs, which is generally about 6,000 feet.

#### *Combretaceæ.*

*Terminalia tomentosa*, Bedd., is a tree of the low levels only.

#### *Myrtaceæ.*

*Psidium Guyava*, Linn., is cultivated at moderate elevations.

#### *Melastomaceæ.*

*Osbeckia chinensis*, Linn., and *O. stellata*, Wall., were collected in Kangra Valley.

#### *Lythraceæ.*

*Ammannia pentandra*, Roxb., is seen only in rice-fields in Kangra Valley.

*Woodfordia floribunda*, Salisb., is a small shrub found in abundance up to 5,000 feet.

*Lagerstræmia indica*, Linn., is cultivated at Chamba.

#### *Onagraceæ.*

*Epilobium angustifolium*, Linn., *E. hirsutum*, Linn. *E. roseum* Schreb., are all common plants.

*Fussia suffruticosa*, Linn., was collected in Kangra Valley.

*Circæa cordata*, Linn., and *C. alpina*, Linn., are plentiful above 2,000 feet.

#### *Cucurbitaceæ.*

*Trichosanthes* sp. is a common climber at low levels.

*Momordica Charantia*, Linn., is cultivated.

*Cucumis Pepo*, Linn., is cultivated.

*Mukia scabrella*, Arn., is a small climber in warm situations.

*Zehneria umbellata*, Thwaites, is also a common climber.

*Sechium edule*, Swartz., is cultivated in the Kangra Valley.

#### *Begoniaceæ.*

*Begonia picta*, Smith, and *B. amæna*, Wall., are moderately common up to 7,000 feet.

#### *Cactææ.*

*Opuntia Dillenii*, Haw., was seen in Kangra Valley.

#### *Ficoideæ.*

*Molugo stricta*, Linn., is common at low levels.

#### *Umbelliferæ.*

*Sanicula europæa*, Linn., is common at most elevations.

*Bupleurum falcatum*, Linn., *B. longicaule*, Wall., *B. tenue*, Don., and other species are plentiful. Other plants of this order collected were, *Pimpinella divesifolia*, DC., *Chærophyllum reflexum*, Lindl., *Fæniculum vulgare*, Gærtn., *Selinum tenuifolium*, Wall., *Pleurosperum Brunonis*, Wall., *Heracleum candicans*, Wall.

The order ought to be well represented, but the above are really all I found in a condition fit for identification.

#### *Araliaceæ.*

*Hedera Helix*, Linn., abundant everywhere up to 10,000 feet.

#### *Cornaceæ.*

*Marlea begoniæfolia*, Roxb. A small tree observed in thickets about 5,000 feet.

*Cornus macrophylla*, Wall., is a tree at low levels.

#### *Caprifoliaceæ.*

*Viburnum stellulatum*, Wall., *V. fætens*, Dcne., are shrubs of the upper forests.

*Abelia triflora*, Br., is a small shrub occurring at 6,000 feet.

There are various species of erect, shrubby *Lonicerae* in the upper forests.

#### *Rubiaceæ.*

*Hymenodictyon excelsum*, Wall., was seen on the low hills between Pathankote and Dalhousie.

*Wendlandia puberula*, DC., was occasionally observed at low elevations.

*Hedyotis hispida*, Retz., was seen by me only in Kangra Valley, but Mr. C. B. Clarke has recorded it from Chamba.

*Oldenlandia coccinea*, Royle., was rarely observed about 5,000 feet.

*Anotis calycina*, Wall., grows on marshy banks of streams about 6,000 feet.

*Hamiltania suaveolens*, Roxb., is common in warm valleys.

*Leptodermis lanceolata*, Wall., is abundant, ranging from 3,000 to 9,000 feet.

*Spermacoce stricta*, Linn., is found in warm localities.

*Rubia cordifolia*, Linn., is a common climber.

*Galium rotundifolium*, Linn., *G. triflorum*, Michx., *G. Aparine* Linn., *G. vestitum*, Don., *G. Mollugo*, Linn., are all common; and *G. vernum*, Scop., also has been collected in Chamba by Mr. C. B. Clarke.

#### *Valerianææ.*

*Valeriana Wallichii*, DC., and *V. Hardwickii*, DC., are common.

#### *Dipsacææ.*

*Morina persica*, Linn., *M. longifolia*, Wall., *M. Coulteriana*, Royle, abound in sub-alpine grassy tracts.

*Dipsacus inermis*, Wall., is common.

#### *Compositæ.*

*Vernonia anthelmintica*, Willd., was very rarely seen at 5,000 feet.

*Adenostemma viscosum*, Forst., grows in warm valleys.

*Solidago Virga-aurea*, Linn., is common up to 8,000 feet.

*Myriactis nepalensis*, Less., abounds in the upper forests.

*Aster Thomsoni*, Clarke, is common about 8,000 feet. *Aster asperulus*, Nees, is recorded from Chamba, and *A. Laka*, Clarke, from Laka, above Dharmsala.

*Brachyactis umbrosa*, Benth., and *B. robusta*, Benth. are both common.

*Erigeron canadensis*, Linn., is frequent in warm localities.

*Erigeron alpinus*, Linn., and *E. multiradiatus*, Benth., are abundant at high levels.

*Conyza japonica*, Less., and *C. stricta*, Willd., inhabit warm places

*Leontopodium alpinum*, Cass., is a plant of the alpine zone.

*Anaphalis nubigena*, DC., *A. Royleana*, DC., *A. triplinervis*, Clarke, *A. contortus*, Hook., are abundant.

*Phagnalon niveum*, Edgew. Grows on rocks about 5,000 feet.

*Gnaphalium luteo-album*, Linn., *G. hypoleucum*, DC., are common in waste places.

*Inula Royleana*, DC., is common from 10,000 to 12,000 feet.

*Inula grandiflora*, Willd., and *I. cuspidata*, Clarke, are also common.

*Vicoa auriculata*, Cass., was seen at low levels only.

*Carpesium cernuum*, Linn., and *C. abrotanoides*, Linn., are frequent.

*Xanthium strumarium*, Linn., *Siegesbeckia orientalis*, Linn., were seen at low elevations in waste places.

*Bidens cernua*, Linn., is recorded from Chamba.

*Bidens tripartita*, Linn., is a marsh plant of low levels, and *B. pilosa*, Linn., luxuriates in waste places.

*Achillea millefolium*, Linn., is common, as are also various species of *Tanacetum* not identified.

*Artemisia parviflora*, Roxb., *A. scoparia*, Waldst. and Kit., *A. vulgaris*, Linn., and others are common and gregarious.

*Senecio graciliflorus*, DC., *S. chrysanthemoides*, DC., *S. amplexicaulis*, Wall., *S. Kunthianus*, Wall., *S. rufinervis*, DC., and others, are more or less common.

*Werneria Ellisii*, Hook. f., is recorded from Chamba.

*Echinops cornigerus*, DC., and *E. nvens*, Wall., are common from 5,000 to 9,000 feet.

*Arctium Lappa*, Linn., was only seen about 8,000 feet.

*Cnicus involucratus*, DC. and *C. Wallichii*, DC., are common.

*Saussurea Candolleana*, Wall., *S. piptathera*, Edgew., *S. labescens*, Hook. f. and T. : I found only these three species in flower, but from indications observed there must be many more.

*Jurinea macrocephala*, Benth., is common about 13,000 feet.

*Tricholepis elongata*, DC., is common up to about 8,000 feet,

*Ainslia aptera*, DC., is common.

*Hieracium crocatum*, Fries., is recorded from Dalhousie.

*Taraxacum officinale*, Wigg., is common.

*Lactuca scariola*, Linn., is common near villages.

*Lactuca longifolia*, DC., is abundant at moderate elevations.

*Lactuca hastata*, DC., *L. macrorrhiza*, Hook, f., *L. Lessertiana*, Clarke, are common.

*Lactuca sagittarioides*, Clarke, was only seen in Kangra Valley.

*Sonchus oleraceus*, Linn., and *Launæa secunda*, Clarke, are common in warmer parts.

#### *Campanulaceæ.*

*Lobelia trialata*, Ham., is recorded from Chamba.

*Cyananthus lobatus*, Wall., was collected above Laka at about 13,000 feet.

*Campanula canescens*, Wall., *C. colorata*, Wall., and *C. argyrotricha*, Wall., are common.

#### *Ericaceæ.*

*Gaultheria trichophylla*, Royle, grows on rocks about 12,000 feet.

*Pieris ovalifolia*, D. Don, is a common small tree up to 8,000 feet.

*Rhododendron arboreum*, Smith, is a common tree.

*Rhododendron campanulatum*, Don, was moderately plentiful at from about 12,000 to 13,000 feet.

*Rhododendron Anthopogon*, D. Don, *R. lepidotum*, Wall., were seen at 13,000 feet.

#### *Plumbagineæ.*

*Plumbago zeylanica*, Linn., was collected about 3,000 feet.

#### *Primulaceæ.*

No Primulas were seen in flower.

*Androsace rotundifolia*, Hardw., and *A. sarmentosa* Wall., were collected.

#### *Myrsinæ.*

*Myrsine africana*, Linn., is a small tree of the lower elevations.

#### *Oleaceæ.*

*Fasminum dispernum*, Wall., is a common climber.

*Fasminum humile*, Linn., and *F. grandiflorum*, Linn., are small shrubs.

*Syringa Emodi*, Wall., was seen at 12,000 feet.

*Fraxinus floribunda*, Wall., becomes a large tree about 6,000 feet

*Olea cuspidata*, Wall., and *O. glandulifera*, Wall., are small trees abundant at lower elevations.

*Apocynaceæ.*

*Nerium odorum*, Soland., is found in warm localities only.

*Asclepiadaceæ.*

*Cryptolepis Buchanani*, Roem., and Sch., is a climber at low elevations.

*Periploca calophylla*, Falc., is a climber of the warm valleys.

*Calotropis procera*, Br., was only seen in Kangra Valley.

*Dæmia extensa*, Br., a large climber observed at 4,000 feet.

*Cyanchum auriculatum*, Herb. Royle, and *C. Dalhousiæ*, Wight, at 6,000 feet.

*Marsdenia Roylei*, Wight, a climber at moderate elevations.

*Ceropegia* sp. (probably *macrantha*, Wight), was seen at 3,500 feet, but the specimens were lost.

*Loganiaceæ.*

*Buddleia asiatica*, Lour., is common at low elevations.

*Gentianaceæ.*

*Gentiana Kurroo*, Royle, was the only representative of the genus seen in flower.

*Jaeschkea latisejala*, Clarke, grows at high levels.

*Swertia purpurascens*, Wall., *S. petiolata*, Royle, and several species not identified, were collected.

*Boraginæ.*

*Cordia Myxa*, Linn., is grown at the town of Chamba.

*Heliotropium strigosum*, Willd., is plentiful in warm localities.

*Cynoglossum micranthum*, Desf., *C. denticulatum*, A. DC., *C. Wallichii*, G. Don, *C. microglochin*, Benth., *C. nervosum*, Benth., are all common.

*Lindelofia spectabilis*, Lehm., and *Paracaryum glochidiatum*, Benth., were found at high levels.

*Convolvulaceæ.*

*Ipomœa hederacea*, Jacq., *I. pes-tigridis*, Linn., *I. eriocarpa*, Br., are plentiful at low elevations.

*Convolvulus arvensis*, Linn., is a weed in fields.

*Evolvulus alsinoides*, Linn., is common in warm situations.

*Cuscuta reflexa*, Roxb., is a common climbing parasite.

*Solanaceæ.*

*Solanum nigrum*, Linn., *S. verbascifolium*, Linn., *S. indicum*, Linn., *S. xanthocarpum*, Schrad., and Wendl., are common.

*Capsicum frutescens*, Linn., is cultivated.

*Withania somnifera*, Dunal, is frequent about 5,000 feet.

*Datura Stramonium*, Linn., and *Hyoscyamus niger*, Linn., are common.

*Scrophularinæ.*

*Verbascum Thapsus*, Linn., is common.

*Linaria ramosissima*, Wall., is abundant on dry rocks about 3,000 to 4,000 feet.

*Scrophularia* (several species of this genus collected were not identified).

*Mazus surculosus*, Don, is common.

*Lindenbergia urticæfolia*, Lehm., is common on rocks up to 6,000 feet.

*Limnophila hypericifolia*, Benth., was gathered from swampy ground in the Kangra Valley.

*Torenia cordifolia*, Roxb., was once seen in Chamba at 5,000 feet.

*Vandellia pedunculata*, Benth., and other species grow in rice swamps.

*Picrorrhiza Kurrooa*, Benth., is common at high levels.

*Wulfenia Annerstiana*, Benth., is to be found from 7,000 to 12,000 feet.

*Veronica Anagallis*, Linn., grows at low levels. Other species inhabit the alpine zone.

*Buchnera hispida*, Ham., and *Centranthera hispida*, Br., are seen in dry places.

*Leptorhabdos Benthamiana*, Walp., is frequent on grassy slopes.

*Euphrasia officinalis*, Linn., exists in profusion between 3,000 and 13,000 feet.

*Pedicularis pectinata*, Wall., *P. gracilis*, Wall., *P. porrecta*, Wall., *P. megalantha*, Don., *P. siphonantha*, Don., *P. carnosa*, Wall., were all collected in flower.

*Pedalinæ.*

*Sesamum indicum*, D C. is cultivated.

*Martynia diandra*, Glox., was seen only in Kangra Valley.

*Acanthaceæ.*

*Strobilanthes alatus*, Wall., is common in the upper forests; *S. angustifrons*, Clarke, has been recorded from the Kangra District.

*Barleria cristata*, Linn., *Lepidagathis hyalina*, Nees, *Justicia simplex*, Don, *Adhatoda Vasica*, Nees, *Dicliptera Roxburghiana*, Nees, (variety *bupleuroides*), and *Peristrophe bicalyculata*, Nees, are all common at moderate elevations.

#### *Selagineæ.*

A species of *Lagotis* was seen at 13,000 feet.

#### *Verbenaceæ.*

*Lantana crenulata*, Ott. and Dietr., grows at the town of Chamba.

*Lippia nodiflora*, Rich., *Verbena officinalis*, Linn., and *Vitex trifolia*, Linn. f., are common at low elevations.

*Callicarpa macrophylla*, Vahl., is a shrub of the shady parts of the lower forests. *Clerodendron fragrans*, Vent., with double white flowers, has run wild about Chamba and its vicinity.

#### *Labiataæ.*

*Acrocephalus capitatus*, Benth., and *Orthosiphon pallidus*, Royle, are found at low levels, as are *Plectranthus striatus*, Benth., *P. Coetsa*, Ham., *P. rugosus*, Wall., *P. incanus*, Link, *Colebrookia oppositifolia*, Smith, *Elsholtzia incisa*, Benth., *E. cristata*, Willd.

*Elsholtzia polystachya*, Benth., is a common shrub in the higher forests.

*Perilla ocimoides*, Linn., and *Mosla dianthera*, Maxim., are to be found in warm localities.

*Mentha sylvestris*, Linn., *Origanum vulgare*, Linn., *Thymus Serpyllum*, Linn., *Micromeria biflora*, Benth., *Calamintha Clinopodium*, Benth., *Calamintha umbrosa*, Benth., *Melissa parviflora*, Benth., are all common.

*Salvia glutinosa*, Linn., *S. hians*, Royle, *S. Moorcroftiana*, Wall., and other species are abundant at high levels, as are also *Nepeta linearis*, Royle, *N. connata*, Royle, *N. eriostachya*, Benth., *N. spicata*, Benth., *N. erecta*, Benth., and other species.

*Scutellaria discolor*, Colebr., *S. grossa*, Wall., *S. angulosa*, Benth., *Brunella vulgaris*, Linn., are abundant.

*Craniotome versicolor*, Reichb., was seen several times about 5,000 feet.

*Anisomeles ovata*, Br. is common at the lower elevations.

*Stachys sericea*, Wall., and other species of the genus inhabit higher levels.

*Leonurus Cardiaca*, Linn., is common, and *Roylea elegans*, Wall., was found as a large bush about Chamba town.

*Leucas Cephalotes*, Spreng., and *L. hyssopifolia*, Benth., are common at low levels.

*Phlomis spectabilis*, Falc., *P. setigera*, Falc., and *P. bracteosa*, Royle, grow in the sub-alpine pastures.

*Ajuga bracteosa*, Wall., and *A. parviflora*, Benth., are both in abundance.

#### *Plantagineæ.*

*Plantago major*, Linn., and *P. lanceolata*, Linn., are common.

#### *Nyctagineæ.*

*Mirabilis Jalapa*, Linn., is cultivated and also frequently occurs as an escape in warm localities.

#### *Amarantaceæ.*

*Celosia argentea*, Linn., and *C. cristata*, Linn., grow in fields.

*Bosia Amherstiana*, Hook. f., is a common climber at 3,000 to 4,000 feet.

*Amarantus spinosus*, Linn., occurs in waste places up to 5,000 feet.

*Amarantus paniculatus* Linn., is extensively cultivated.

*Amarantus Blitum*, Linn., is found in waste places, as is also *Alternanthera sessilis*, Br.

*Æruea scandens*, Wall., is frequently seen at moderate elevations.

#### *Cheonopodiaceæ.*

*Acroglochin chenopodioides*, Schrad., was collected on various occasions about 5,000 feet.

*Chenopodium Botrys*, Linn., is common in waste places.

#### *Phytolaccaceæ.*

*Phytolacca acinosa*, Roxb., is abundant in many places at 6,000 feet.

#### *Polygonaceæ.*

*Polygonum aviculare*, Linn., *P. plebejum*, Linn., *P. viviparum*, Linn., *P. amplexicaule*, Don, *P. vacciniifolium*, Wall., *P. stagninum*, Ham., *P. Hydropiper*, Linn., *P. alatum*, Ham., *P. capitatum*, Ham., *P. dumetorum*, Linn., etc. are all more or less common.

*Fagopyrum cymosum*, Meissn., is abundant in moist ravines, especially about 8,000 feet.

*Rheum*. I saw no species of this genus in flower or fruit.

*Oxyria digyna*, Hill., is a common plant of the Alpine Zone.

*Rumex nepalensis*, Spreng., is common in wet places where cattle have been kept.

*Rumex hastatus*, Don., is frequent on banks up to 7,000 or 8,000 feet.

#### *Laurineæ.*

*Litsæa umbrosa*, Nees., is a small tree of the forests about 6,000 feet.

#### *Thymelaceæ.*

*Daphne olcoides*, Schreb., is a small shrub most frequent about 5,000 feet.

*Wilkstræmia canescens*, Meissn. was seen rarely about 6,000 feet.

#### *Eleagnaceæ.*

*Eleagnus umbellatus*, Thunb., a small tree with acidulous fruit, found about 5,000 feet,

#### *Loranthaceæ.*

*Loranthus pulverulentus*, Wall., is frequent on Apricot trees.

*Viscum album*, Linn., affects Walnut trees and *Viscum japonicum*, Thunb., seems to prefer *Quercus dilatata*.

#### *Euphorbiaceæ.*

*Euphorbia hypericifolia*, Linn., *E. Emodi*, Hook. f., and *E. pilulifera*, Linn., are three common procumbent weeds in warm localities.

*E. Wallichii*, Hook. f., has been recorded from Chamba.

*E. pilosa*, Linn., is common at high levels, and indications of other species were noted.

*Sarcococca pruniformis*, Lindl., is a small shrub in thickets up to 10,000 feet.

*Phyllanthus urinaria*, Linn., *P. Niruri* Linn., are common weeds near streams in warm situations.

*Acalypha brachystachya*, Hornem., and *A. ciliata*, Forst., are frequent in waste places up to 6,000 feet.

*Mallotus philippinensis*, Muell. Arg., is a common tree in warm valleys, but scarcely extends upwards beyond 4,000 feet.

*Ricinus communis*, Linn., was seen near villages in Kangra Valley.

*Sapium sebiferum*, Linn., is cultivated as a road-side tree in Kangra Valley.

*Urticaceæ.*

*Ulmus Wallichiana*, Planch., is a large tree ascending to about 10,000 feet.

*Celtis australis*, Linn., is a tree common at low elevations. Some well-grown specimens can be seen within a short distance of the town of Chamba.

*Trema politoria*, Planch., is confined to elevations below 3,500 feet. It was often noted as a low, twiggy shrub, bearing flowers in profusion.

*Cannabis sativa*, Linn., is extremely common near villages and in waste places.

*Morus alba*, Linn., is cultivated.

*Ficus religiosa*, Linn. Large trees are planted in the low valleys where they afford a grateful shade.

*Ficus clavata*, Wall., and *F. hispida*, Linn. f., are shrubs not ascending above 4,000 feet.

*Ficus foveolata*, Wall., is a common climber, generally found on rocks, ascending to 7,000 feet.

*Ficus palmata*, Forsk., is an extremely abundant tree ranging upwards to 6,000 feet.

*Ficus nemoralis*, Wall., and *F. Roxburghii*, Wall., ascend to 6,000 feet.

*Pilea umbrosa*, Wedd., and *P. scripta*, Wall., are common.

*Urtica parviflora*, Roxb., ascends to 10,000 feet.

*Girardinia heterophylla*, Dene., is common in moist forests up to 6,000 feet.

*Lecanthus Wightii*, Wedd., and *Elatostema sessile*, Forst., are abundant in narrow humid gorges.

*Boehmeria platyphylla*, Don., was rarely seen in ravines at 3,000 feet.

*Pouzolzia indica*, Gaud., *P. hirta*, Hassk., are found at low levels.

*Pouzolzia pentandra*, Benn., was collected in rice-fields in Kangra Valley.

*Debregeasia hypoleuca*, Wall., is common up to 5,000 feet.

*Platanaceæ.*

*Platanus orientalis*, Linn. Several fine specimens of this tree were observed in various localities at moderate elevations.

*Juglandææ.*

*Juglans regia*, Linn. Cultivated trees, yielding large crops of excellent fruit, are abundant everywhere.

*Cupuliferæ.*

*Betula utilis*, Don, becomes a shrub at and above 12,000 feet

*Alnus nepalensis*, Don, is a large tree common in many places up to 8,000 feet.

*Quercus semecarpifolia*, Smith, is a large tree at 6,000 to 10,000 feet, extending upwards almost to the limits of woody vegetation as a densely gregarious shrub. There is a noble forest of this species at Laka above Dharmsala.

*Quercus dilatata*, Lindl., is a tree so common in Chamba as to be a characteristic feature of the landscape between 4,000 and 9,000 feet. At the latter elevation it is almost immediately replaced by *Quercus semecarpifolia*.

*Quercus Ilex*, Linn., is found at the same elevations, but is rarer than the last.

*Quercus incana*, Roxb., is common in the Kangra Valley.

*Quercus glauca*, Thunb., was seen in a few localities about 6,000 feet.

*Corylus Colurna*, Linn., is common in forests from 6,000 to 10,000 feet.

*Carpinus viminea*, Wall., is frequent about 7,000 feet.

*Salicineæ.*

*Salix alba*, Linn., is cultivated as a shady road-side tree.

*Salix elegans*, Wall., was found in fruit about 12,000 feet.

Indications of additional species were noted, but in the absence of flowers and fruits no specimens were collected.

*Populus ciliata*, Wall., is a tree common up to 10,000 feet. There is a fine specimen on the flat above the bungalow at Tisa.

*Gnetaceæ.*

*Ephedra vulgaris*, Rich., was seen on dry slopes at 12,000 feet.

*Coniferæ.*

*Cupressus torulosa*, Don, was a tree observed in various localities.

*Juniperus communis*, Linn., *J. pseudo-sabina*, Fisch. and Mey., *J. recurva*, Ham., were seen.

*Pinus excelsa*, Wall., replaces *P. longifolia* above 6,000 feet.

*Pinus longifolia*, Roxb., is common up to 6,000 feet.

*Cedrus Libani*, Barrel. var. *Deodara*, Hook. f., is abundant in many localities.

*Picea Morinda*, Linn., is common, as is also *Abies Webbiana*, Lindl.

*Orchideæ.*

Very few examples of this order were found in flower. Those collected were *Liparis* sp., *Epipactis latifolia*, Swartz., *Herminium angustifolium*, Benth., *Habenaria marginata*, Colebr.

*Scitamineæ.*

*Rosœa alpina*, Royle, ascends to about 10,000 feet.

*Cautleya lutea*, Royle., was seen rarely about 7,000 feet.

*Irideæ.*

The genus *Iris* is represented in Chamba, but no plants were found in flower.

*Dioscoreaceæ.*

*Dioscorea kumaonensis*, Kunth, and *D. deltoidea*, Wall., were seen.

*Liliaceæ.*

*Smilax parvifolia*, Wall., is common.

Several species of *Polygonatum* were observed, but none were in flower.

*Lilium polyphyllum*, Don, was collected in woods about 8,000 feet.

*Pontederiaceæ.*

*Monochoria nastæfolia*, Presl., was common in rice-fields and pools in Kangra Valley.

*Commelinaceæ.*

*Aneilema nudiflorum*, Brown, and *Cyanotis barbata*, Don, are common up to 6,000 feet.

*Floscopa scandens*, Lour., was collected in rice-fields in Kangra Valley.

*Juncaceæ.*

Several species of *Juncus* collected were not identified.

*Palmæ.*

There are a few cultivated trees of *Phœnix sylvestris*, Roxb., on flat land near the town of Chamba.

*Aroideæ.*

Several species of *Arisæma* collected but not identified.

*Lemnaceæ.*

*Lemna* *sp.* seen in a tank at Chamba. It is common in Kangra Valley.

*Alismaceæ.*

*Alisma Plantago*, Linn. was seen in pools in Kangra Valley.

*Sagittaria guayanensis*, H. B. and K., was once collected in Kangra Valley.

*Naiadaceæ.*

*Potamogeton* *spp.* were common in rice-fields in Kangra Valley but no flowers nor fruits were seen.

*Eriocaulaceæ.*

*Eriocaulon quinquangulare*, Linn., is abundant in Kangra Valley.

*Cyperaceæ.*

*Pycnus sanguinolentus*, Nees., *P. capallaris*, Nees., *Cyperus difformis*, Linn., *C. Haspan*, Linn., *C. niveus*, Retz., *C. aristatus*, Rottb., *C. Iria*, Linn., *C. eleusinoides*, Kth. and certainly many more were all more or less common.

*Mariscus Sieberianus*, Nees, *Bulbostylis barbata*, Kunth., *Eriophorum comosum*, Wall., and *Lipocarpa argentea*, Brown, were common at low elevations.

*Carex flicina*, Nees, was the only species of the genus I found in flower.

*Gramineæ.*

*Paspalum scrobiculatum*, Linn., *P. sanguinale*, Lamk., at low levels.

*Panicum Isachne*, Roth., *Panicum miliaceum*, Linn., extensively cultivated; *Panicum plicatum*, Lamk. is common in Kangra Valley. *Oplismenus* *spp.* are common; *Arundinella setosa*, Trin., is recorded from Chamba; *A. brasiliensis*, Raddi, is common; *A. Wallichii*, Nees, is frequent in Kangra Valley.

*Setaria italica*, Beauv., is cultivated; *S. glauca*, Beauv., and *S. verticillata*, Beauv., are common.

*Pennisetum flaccidum*, Griseb., and *P. orientale*, Rich., are common.

*Oryza sativa*, Linn., is cultivated on the flat floors of valleys in Chamba and is the principal grain crop in the Kangra Valley.

*Coix Lachryma-Jobi*, Linn., grows in swamps.

*Pollinia argentea*, Trin., and *P. nuda*, Trin., are common.

*Erianthus Ravennæ*, Beauv., and *E. fulvus*, Nees, are tall handsome grasses and common.

*Pogonatherum saccharoideum*, Beauv., is common in warm situations.

*Arthraxon lanceolatus*, Hochst., *A. ciliaris*, Hack., *A. microphyllus*, Hochst., are all common.

*Apluda varia*, Hack., is abundant.

*Rottboellia speciosa*, Hack., *R. perforata*, Roxb., *Manisuris granularis*, Linn. f., are frequent in low valleys.

*Andropogon tristis*, Nees, *A. Ischæmum*, Linn., *A. micranthus*, Kunth, *A. assimilis*, Steud., *A. serratus*, Thunb., *A. squarrosus*, Linn. f., *A. Gryllus*, Linn., *A. monticola*, Schult., *A. annulatus*, Forsk., *A. contortus*, Linn., *A. Iwaranacusa*, Jones, and others of the genus are common.

*Anthistiria anathera*, Nees, *Aristida Adscensionis*, Linn., *A. cyanantha*, Steud., are frequent at lower levels.

*Stipa Orthoraphium*, Steud., *Oryzopsis* sp., *Phleum alpinum*, Linn., abound in the higher zones.

*Sporobolus diander*, Beauv., and *S. piliferus*, Kunth, grow at moderate elevations.

Several species of *Agrostis*, *Calamagrostis*, *Eragrostis*, *Poa*, *Festuca*, etc., were not identified.

*Muehlenbergia sylvatica*, Torr. and Gr., *M. viridissima*, Nees, are frequent, and *M. himalayensis*, Hack., has been recorded from Chamba.

*Cynodon dactylon*, Pers., and *Elytrophorus articulatus*, Beauv., grow in sunny places.

*Neyraudia madagascarensis*, Hook., has been recorded from Chamba.

*Dactylis glomerata*, Linn., and *Brachypodium sylvaticum*, Beauv., grow in the upper forests.

*Triticum vulgare*, Vill., is cultivated.

*Arundinaria falcata*, Nees, is found at moderate elevations.

A species of *Bambusa* is cultivated about villages in Kangra Valley.

#### *Filices.*

*Woodsia clongata*, Hook., is common at Laka above Dharmsala.

*Davallia pseudo-cystopteris*, Kunze, is also common on trees at Laka, and *D. immersa*, Wall., has been recorded from Chamba.

*Cystopteris fragilis*, Bernh., occurs at higher levels.

*Adiantum lunulatum*, Burm., and *A. caudatum*, Linn., are confined to warm situations.

*Adiantum Capillus-Veneris*, Linn., and *A. venustum*, Don, reach elevations of 10,000 feet.

*Adiantum pedatum*, Linn., is recorded from Kangra and Chamba.

*Cheilanthes farinosa*, Kaulf., with its variety *Dalhousiæ*, *C. albo-marginata*, Clarke, and *C. rufa*, Don., are common, as are *Onychium japonicum*, Kunze, *Pellæa nitidula*, Wall., *Pteris longifolia*, Linn., *P. cretica*, Linn., *P. excelsa*, Gaud., *P. aquilina*, Linn., *P. Wallichiana*, Agardh, and *Woodwardia radicans*, Smith.

*Asplenium alternans*, Wall., is very common, as are the other members of the genus noted below.

*A. Trichomanes*, Linn., *A. septentrionale*, Linn., *A. unilaterale*, Lamk., *A. Adiantum-nigrum*, Linn., *A. fontanum*, Bernh., *A. varians*, Hk. and Gren., *A. thelypteroides*, Michx., *A. nigripes*, Mett., *A. Filix-femina*, Bernh. and its varieties, *A. fimbriatum*, Wall., *A. japonicum*, Thunb., (in Kangra only), *A. polypodioides*, Mett., and *A. Ceterach*, Linn.

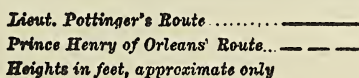
*Aspidium auriculatum*, Linn., variety, is common about 8,000 feet.

*A. ilicifolium*, Don., *A. Thomsoni*, Hook., *A. aculeatum*, Swartz, *A. Prescottianum*, Wall., with its variety *Bakeriana*, are common at higher levels.

*A. coryotideum*, Wall., has been recorded from Chamba.

*Nephrodium prolixum*, Baker, *N. Brunonianum*, Wall., *N. barbigerum*, Hook., *N. Filix-mas*, Linn., and its varieties; *N. odoratum*, Baker, *N. Boryanum*, Willd., *N. aridum*, Don., *N. molle*, Desv., are common.

The remaining forms of the order observed were *Polypodium distans*, Don, *P. punctatum*, Thunb., *P. amœnum*, Wall., *P. lachnopus*, Wall., *P. fissum*, Blume, *P. lineare*, Thunb., *P. clathratum*, Clarke, *P. hastatum*, Thunb., *P. ebenipes*, Hook., *Nothochlæna vellea*, R. Br., *Gymnogramme Totta*, Hook., *G. Levingii*, Clarke, *G. fraxinea*, Don., *G. vestita*, Wall., *Vittaria elongata*, Swartz, *Osmunda Claytoniana*, Linn., and *Lygodium japonicum*, Swartz.



E. POTTIN



A NOTE  
ON  
THE BOTANY OF THE KACHIN HILLS  
NORTH-EAST OF MYITKYINA.

*By E. POTTINGER and D. PRAIN.*

§ I.—INTRODUCTORY.

[ *E. POTTINGER and D. PRAIN.* ]

IN February 1897 Lieutenant Eldred Pottinger, R.A., sent a man to the Royal Botanic Garden at Calcutta to be trained to collect botanical specimens, and was supplied from the Herbarium with drying paper, etc., prior to his departure for Rangoon, where he was joined by Lieutenant Lawrance, 3rd Seaforth Highlanders, in whose company a journey was made in the Kachin Hills during the period from March 13 till June 6, 1897.

The specimens obtained during the journey were despatched at intervals to the Calcutta Herbarium, where they were determined by Dr. Prain. The present note has been prepared conjointly from the field notes accompanying the specimens collected by Lieutenant Pottinger's party and from the identifications effected at Calcutta; but it should be understood that Dr. Prain accepts all responsibility for the identifications and for the phytogeographical deductions of the concluding chapter. For the route-map that accompanies the note and for the sketch of the vegetation of the country traversed by his party, Lieutenant Pottinger, on the other hand, is alone responsible.

That the specimens collected during the expedition are neither so complete nor so numerous as could be wished, is largely due to the unfortunate fact that the party was attacked on May 23 and had to beat a hasty retreat, abandoning at the same time the greater part of the baggage. From this date forced marches during continuously wet weather were necessary, and time for the collection and

preservation of many specimens was not available. During this period, however, Lieutenant Pottinger from time to time noted the presence of various plants; these have been included in their proper place in the systematic census of Kachin Hill species; in order to obviate any possible error they have not, however, been used at all in the passages wherein the affinities of the Kachin flora are discussed. To this end, all such references are enclosed in square brackets and the species in question have not been accorded a serial number.

Lieutenant Pottinger's contribution to our knowledge of the Kachin flora has not, however, been confined to the making of a collection during his journey. While passing through Myitkyina he was so fortunate as to enlist the sympathies of Lieutenant Cruddas, S.C., Commandant of the battalion of Frontier Police stationed there, on behalf of the Royal Botanic Garden. With much kindness Lieutenant Cruddas undertook to look after and assist in every way in his power, a native collector belonging to the Garden establishment. This man, Shaik Mokim, thanks to the help and care of Lieutenant Cruddas, has been able to send at intervals during 1897 a most interesting collection of specimens from the vicinity of Myitkyina itself, and from the neighbourhood of the various out-posts held by the force that Lieutenant Cruddas commands. He has also accompanied Lieutenant Cruddas during tours made in the course of his official duties, collecting by the way. The specimens thus obtained, having been mainly collected during the months subsequent to the termination of Lieutenant Pottinger's expedition, largely augment the Kachin list, and assist us greatly in forming a general impression of the nature and affinities of the flora of the region. All the specimens obtained during Lieutenant Pottinger's expedition are indicated by (E); those subsequently collected by the Garden collector are marked (C).

## § 2.—THE VEGETATION OF THE KACHIN HILLS.

[ *E. POTTINGER.* ]

Myitkyina, the starting point of the expedition, is situated on the right bank of the Irrawaddy, in a well-watered plain stretching westward towards Mogaung. A large portion of this plain was formerly devoted to rice-cultivation, but wars between the Burmese and the Kachins, about 1882, devastated the greater part of the country, which has consequently reverted to jungle. As a general rule this jungle is very dense, and is often impenetrable owing to the under-

growth of low shrubs, creepers, and prickly palms. There are a few teak trees, but of stunted growth, especially near the river.

The same kind of jungle exists on the eastern bank of the Irrawaddy, but becomes wilder and denser as one approaches the hills. In March and April, owing to the dry heat and the jungle-fires, but few flowering plants are seen.

The temperature in the shade reaches a maximum of  $108^{\circ}\text{Fh.}$  in the hot weather, and a minimum of  $35^{\circ}\text{Fh.}$  in the cold weather; the annual rainfall is about 100 inches.

From Namlao northwards the country is very mountainous and is intersected by rapid streams flowing into the Nmai Kha. As far as Chin-ngaw Kha these hills are fairly well peopled, and owing to the 'toungyah' or 'jhum' system of cultivation that prevails, no jungle with large trees is to be met with, except in a few of the steepest ravines and along the banks of some of the rivers. In this 'toungyah' tract the ground is usually tilled about once in seven years; in the region around Tawlang, near Lat.  $26^{\circ}38'\text{N.}$ , about once in four years.

Around Sadôn frosts occur in the cold weather, the maximum hot weather temperature being there about  $85^{\circ}\text{Fh.}$  in the shade. Snow has never been known to fall except on the higher hills over 9,000 feet. The native collector attached to the party ascended Sabu Pum, 11,300 feet, from Sadôn, reporting dense bamboo and cane jungle almost to the summit, but no pines or firs.

North of the Chipwi Kha the hills become much steeper and only the river valleys are inhabited, the higher hills being covered with dense virgin-forest. The expedition was unable to halt at any one place for a sufficiently long time to admit of collections being made in these forests; the only track ran through the zone of cultivated or fallow 'toungyah' land, and it was impossible to deviate from it sufficiently far to reach the virgin-jungle beyond.

Two high ranges of mountains were crossed; the first about 12,000 feet high in Lat.  $26^{\circ}22'\text{N.}$  and Lon.  $98^{\circ}38'\text{E.}$ ; the second about 9,000 feet in Lat.  $26^{\circ}12'\text{N.}$  and Lon.  $98^{\circ}40'\text{E.}$  On both ranges the vegetation was much more luxuriant on the southern than on the northern slopes. On the first-mentioned range the summit was covered with coarse grass; for about 3,000 feet down the sides there were large fir trees, but no pines; in this neighbourhood enormous quantities of a wild garlic were met with. Unfortunately no specimens could be taken either on this range or on the second, where the same fir was met with extending to the summit. On the southern slopes near the sources of the Nachawng Kha, a beautiful

variety of *Calanthe brevicornu* occurred in great quantity. Two flowers of this were placed in a note-book along with a description.\*

The staple crop throughout the Kachin Hills is rice, this being supplemented by Indian corn, pumpkins, vegetable marrows, various runners, such as *Dolichos Lablab*; bringals, small tomatoes and chillis are also grown to a slight extent in most villages. At one village, Wadzé bok, these small tomatoes were found growing freely in a semi-wild condition. During two season's experience at Sadôn some years ago the writer tried peas, broad beans, kidney beans, potatoes, cabbages, cauliflowers, beet-root, lettuce, celery, asparagus, radishes; all were found to grow fairly well. A kind of red ant, however, attacked the roots of most of the plants, more particularly those of turnips, which were in consequence continual failures.

Ground for cultivation is cleared as follows:—A patch of jungle having been selected, the smaller trees are felled and the larger ones ringed during the cold weather; the whole is then set on fire in March or April. The larger pieces of half-burned felled timber are afterwards removed, and the surface of the ground is broken by means of small hoes, so that the ashes are mixed with the soil. It is commonly supposed that land is allowed to lie fallow for from four to seven years, because the soil is so poor that it will not sooner yield another crop. It seems, however, that the true reason is that after one crop has been reaped the land, being exposed to the winds, becomes self-sown with so many species of forest-grasses and weeds that these defy all efforts to eradicate them, and would inevitably choke any crop that might be planted the second season. The land is consequently allowed to lie fallow till the tree-jungle has become large enough to displace the herbaceous growth; it is then a comparatively simple matter to clear away this tree-jungle. In sowing rice, a line of men and women start from the foot of the hill and work upwards. By means of a stick held in the right hand small holes are made in the ground and the seed, dropped in from the left hand, is then roughly covered up. Weeding is carried on continuously from the time the plants are about six inches high. Both red and white rice are grown.

No wet paddy cultivation was met with north of Kwitu except in the Nachawng Kha Valley between the villages of Galing and Peiāp; this last was entirely worked by Lashis. From Kwitu southwards wet-cultivation is in the hands of Chinese Shans; buffaloes are

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\* This description is given under the species referred to in the systematic list.

invariably used for the ploughing. In reaping all their cereal crops only the heads are taken, the straw being left on the field.

In the villages at higher elevations (generally over 3,500 feet above sea-level) rice-cultivation gives place almost entirely to the following:—

1. Maize (*Zea Mays*).
2. A small-grained millet (*Setaria italica*).
3. The marua or rági millet (*Eleusine Coracana*).
4. Buckwheat (*Fagopyrum esculentum*).

Close to every village were small gardens with plants of tobacco and cabbage-mustard, occasionally tea, less frequently opium. Pumpkins, *sím* and *catiang* beans, a garlic and a coarse radish were often found growing round huts in the "toungeyah" clearings; *kachhu* too is grown in the majority of the villages.

Tobacco leaves when plucked are half-dried in the sun, then finely shred and further exposed to the sun till they are sufficiently cured. Among the Yawyins this curing process is continued till the leaf assumes a light yellow colour. The Marus on the other hand use the leaf while still green; in this state if smoked in a pipe it burns one's mouth. Only *Nicotiana tabacum* was seen during the journey.

The smoking of tobacco is confined among the Marus to old people who have no teeth left wherewith to chew. Among the Yawyins all the adults smoke and the chewing of tobacco is not indulged in.

Most Kachins, however, chew a mixture of lime, tobacco and *pán*; very occasionally also betel-nut is chewed. The *pán* and *supári* are probably both imported; at any rate neither *Piper Belle* nor *Areca* were met with.

Near the Kyeng-mo Kha, *Cannabis sativa* was found wild in the forest, but the people appeared to have no knowledge of *gánja*, and no idea that this plant possesses narcotic properties.

To obtain opium the poppy-head, when ripe, is notched with a *dá* and the exuding juice is wiped off on a piece of cloth; the cloth when saturated is dried and rolled up, the opium being stored and carried about in this form. When required for use the cloth is put into a small metal ladle with some water and boiled over a fire; after having been boiled the cloth is removed. Plantain leaves, very finely shred and toasted brown in front of a fire, or in place of plantain-leaf, finely cut tobacco being then added in quantity sufficient to absorb the mixture of water and opium contained in the ladle, the resulting mass is rolled into balls for smoking. The only object of the cloth is to prevent waste, and the same piece is boiled over and over

again till the last trace of opium has disappeared. The smoke is drawn through water as in a *hookah*. These details are given because an impression has got abroad that the cloth itself is actually smoked.

Tea is indigenous and was met with wild in the forest in various places, as at Lammuk and elsewhere ; it more resembles the Assam plant than the Chinese. At one or two villages a few bushes, as has already been indicated, were found planted, but no attempt is made to cure the leaves ; these are picked green and boiled as required.

The castor-oil plant was found cultivated in villages near the British, and again near the Chinese, frontier, but was not met with in the more remote ones. The people grow the plant in order to express the oil from its seeds, though they only use this for burning and are quite unaware of its medicinal properties. In the upper valleys the people have no lamps and seem to have no idea of using any kind of oil, either for burning or for cooking.

A powerful spirit is distilled from rice, and several kinds of beer are brewed. The most usual beer, made from rice, varied with each brew and tasted somewhat like perry or cider ; it is acceptable when one is thirsty, though the taste is usually rather mawkish. In the beers made from *Setaria* and *Eleusine*, and in the Kachin Hills it seems to be the former that is usually employed, the grain is left in the fermented liquor, so that the result is a thin gruel of an uninviting appearance. It proves, however, to be a pleasant pick-me-up, without being at all 'heady' if drunk when one is heated and fatigued ; it serves indeed to some extent as a food as well as a drink. Yet another beer is made from maize, but this was only met with among the Yawyins, though it is said to be prepared by other tribes also. This has a very pleasant flavour, but is strong and 'heady.' All these liquors have a tendency to provoke rather than to allay thirst. In passing through a Maru village a malodorous substance of a dark-brown colour was seen drying on trays in the sun. This was found on enquiry to be the substance employed in fermenting these beers ; it was said to be the product of the root of a particular tree, of which unfortunately no specimens could be obtained.

The "Seit" palm was fairly common, especially in the tract between Kwtu and the Tumpang Kha ; its long pendulous clusters of fruits, which look like great chains of large beads, render it a very conspicuous object.\* When bamboos are scarce, the rind of its stem

\* From Lieutenant Pottinger's description this is evidently a *Caryota* ; indeed, on being shown *C. urens* and *C. mitis* in the Botanic Garden on his return, Lieutenant Pottinger at once decided that it must be very nearly related to these species, especially to the former, of which it has all the habits, though the pinnules of the leaves differ. Possibly it is *Caryota obtusa* Griff., originally obtained in the not far distant Mishmi Hills.—D. P.

is used for making house-floors and walls; a kind of waterproof coat, termed *Li-kyeng* by the Kachins, is also manufactured from the very fibrous tissue just within the rind. Among the Nanwa Marus the pith of this tree is boiled and eaten; the sago obtained is however very flavourless and did not seem highly nutritious; unfortunately no specimens of this tree were collected.

Besides the fibre obtained from the *Caryota* another fibre, apparently obtained from *Villebrunea*, is used for making ropes. All the cloths manufactured by the Kachins are of cotton locally produced.

Cotton is grown in small patches near villages; the ground is carefully prepared, all stones and weeds being removed; the seed is then scattered loosely over the surface and driven into the ground by the first heavy shower of rain. The surplus cotton crop forms the principal commodity exported to China in exchange for various necessities and luxuries.

The plant from which the inhabitants obtain their dark blue dye does not appear to be cultivated. It seems to be found pretty generally wild in the virgin-forests, but the plant was never itself actually seen; when asked for it was always spoken of as growing some considerable distance away. Its use is common throughout the Kachin Hills and in many parts of the Shan States; it is apparently the well-known *rúm* of the Assamese (*Strobilanthes flaccidifolius*).

A considerable demand exists among the Chinese for a small plant, common in the higher ranges, which yields a yellow dye. No specimen of this could be brought away, though the plant was pointed out to the party while crossing the mountains between the head-waters of the Laking Kha and the Nachawng Kha. Madder is also used as a dye by the Kachins, but the plant itself was not seen. No green dye seems to be known in the Kachin Hills.

In many villages there were walnut trees, but the nut was usually very hard and thick-shelled. Small apricot trees were met with, and a kind of crab-apple (*Docynia indica*) was also seen. In the upper valley of the Nachawng Kha, near Galing village, mulberry trees in ripe fruit were met with at the end of May. Yellow and black raspberries and brambles were found at elevations above 3,000 feet, some of them being fairly palatable. A *Cinnamon*, either *C. Tamala* or an allied species, the young shoots of which have the cinnamon flavour and smell, was also met with, as was a Baer fruit (*Zizyphus*); the latter was very common but very sour-fruited. Along the foot of the hills mangoes and jack-fruits, always planted, were occasionally met with, as were litchis; once too the fruits of *Diospyros Kaki*, the *kég*, were offered to the party. Two

or three species of edible wild figs were fairly common. Wild plantains are plentiful along the streams and on the lower hills, but the fruit is full of black seeds and is uneatable.

Among the striking plants noticed were a white rose (*Rosa involucrata*), *Hydrangeas*, *Gardenias*, *Begonias*, and a very fine species of *Chirita* (*C. speciosa*); also balsams, honey-suckle, several jasmynes, a clematis, and ivy. A holly, too, perhaps *Ilex dipyrrena*, was seen. In the hills above 5,000 feet several species of *Rhododendron*, both red-flowered and white, were met with, and the *Azalea* (*Rhododendron formosum*) so common in the Khasia Hills, was also frequently met with in the Kachin Hills. A wild white strawberry and white violets were also fairly common on the high ranges. South of the Tumpang Kha, *Ficus elastica* is to be met with, but never in any great quantity.

Orchids were very numerous throughout the area traversed, and, as might be expected, species of *Dendrobium* bulked largely among the showy forms. A fine variety of *Cymbidium eburneum* was collected, and a beautiful *Calanthe*, common on one of the higher ranges, has already been alluded to. Two species of *Anæctochilus* were seen, also two of *Microstylis*, one of the latter being apparently the same as a species common at Shillong in the Khasia Hills.\* *Cypripedia* were conspicuous by their absence.

Of cryptogams a *Lycopodium*, two distinct *Selaginellas*† and many ferns were seen; the most striking fern was *Osmunda regalis*, which is plentiful in the upper valley of the Nachawng Kha, but of which specimens could not be brought away.

Taking the line of the mountain range which runs more or less north and south in Lon. 98°33' E. and between Lat. 25°55' and 26°28' N., it was observed that to the east of this line pine-trees, apparently *Pinus Khasya*, were very common, while to the west of it only occasional trees occurred; on the other hand, no large bamboos were seen to the east of this line. Above 4,000 feet the only bamboo found was a very slender *Arundinaria*, which was not in flower and was not collected.

Bamboos are universally employed for carrying water. Baskets, trays, small cups and flasks of all shapes and sizes are made from

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\* Neither of the *Anæctochili* or *Microstyles* referred to occur among Lieutenant Pottinger's specimens; their identity cannot therefore be determined. The *Cymbidium* referred to is present, but though the specimen suffices to show that Lieutenant Pottinger's specific identification is correct, it is not in a condition to admit of its varietal separation.

† Lieutenant Pottinger in reality transmitted specimens of three *Selaginellas*.

bamboos; ropes and withes too are almost invariably made from bamboos; cords or utensils of cane were never seen. The only exceptions were the occasional ropes of *Villebrunea* fibre and the canes used for fixing bridges. Matting for house-floors and house-walls are usually made of bamboo; the walls are sometimes constructed of unsplit bamboo stems, which are also at times used as an outer covering for the thatch of the granaries; these granaries, as a rule, are situated some little distance away from the dwelling-houses. The thatch itself is always some grass or sedge, never the straw of any crop. Pipe-bowls are made of the root of an *Arundinaria*; the same species is often used also for walking-sticks, the root forming the top.

A special use of bamboos is in the manufacture of bows and arrows. The bow is a crossbow tightly strung; the string is never a vegetable fibre. The bolt is thin and light, about a foot long, and is made by paring down a thickish bamboo stem; it is unfeathered, but the feather is replaced by shavings of bamboo, which serve to steady the flight. The Marus do not poison their arrows nor do they use any iron in their construction, though they harden the tips by means of fire. The head is of a piece with the shaft, but a small circular groove is cut at the base of the head in order that it may readily snap off in a wound. The Yawyins use metal-tipped arrows which, moreover, they poison. Apparently, to judge by the symptoms induced, an *Aconitum* is used for the purpose; the plant itself was not obtained.

Spear-shafts are never made of bamboo but of a wood to which the name iron-wood is given. The tree used was not met with by the party, but it is probable that it is not the well-known *nahor* or iron-wood of Assam (*Mesua ferrea*), since that species was not met with throughout the journey.

The ridge-poles, beams, posts and frame-work generally of the houses are of various timbers, never of bamboo. The houses of the Marus often have no doors; the doors of Yawyin houses consist of single planks measuring roughly seven feet by three, by two inches thick, hewn by means of *dás* out of solid logs.

At the more important ferries on the 'Nmai Kha, boats similarly hewn out of single logs are in use. The largest seen was forty feet long by two feet across or thereby. At the smaller ferries bamboo rafts are used.

Across the Kyengmo Kha a cane bridge is thrown from a pair of banyan trees on one bank to a similar pair on the bank opposite. These trees, almost the only banyans seen during the journey, had been, so the party were informed, purposely planted to serve as

supports for this bridge ; their roots have been specially trained to interlace and so form natural arches over the approaches and afford a substantial support for the connections at either end.

The Itinerary of the expedition under Lieutenant Pottinger may be most conveniently given here.

Name of camp.				Date.			Height above sea-level.
Myitkyina	.	.	.	.	22nd	March 1897	450 ft.
Namlao	.	.	.	.	"	" "	500 "
Bansparao	.	.	.	.	"	" "	2,000 "
Namli	.	.	.	.	24th	" "	2,000 "
Sadôn	.	.	.	.	25th	" "	4,700 "
Halt	.	.	.	.	26th	" "	—
Noi-chong	.	.	.	.	27th	" "	—
on Nawgo Kha	.	.	.	.	28th	" "	1,300 "
Phalé	.	.	.	.	29th	" "	2,000 "
'Nsentaru	.	.	.	.	30th	" "	500 "
Halt	.	.	.	.	31st	" "	—
Halt	.	.	.	.	1st	April "	—
Patzam	.	.	.	.	2nd	" "	1,100 "
Tungwa Tungsa	.	.	.	.	3rd	" "	2,300 "
on 'Nmai Kha	.	.	.	.	4th	" "	500 " ?
Ning Ting	.	.	.	.	5th	" "	800 "
Shigu Ferry	.	.	.	.	6th	" "	800 "
Halt	.	.	.	.	7th	" "	—
Lammuk	.	.	.	.	8th	" "	2,400 "
Halt	.	.	.	.	9th	" "	—
Halt	.	.	.	.	10th	" "	—
on Chipwi Kha	.	.	.	.	11th	" "	—
Chingnat	.	.	.	.	12th	" "	—
Khanchik	.	.	.	.	13th	" "	—
Mathè	.	.	.	.	14th	" "	—
on Mao Khoi Kha	.	.	.	.	15th	" "	—
Wadzè bok	.	.	.	.	16th	" "	3,000 ft.
on Uyan Kha	.	.	.	.	17th	" "	—
Kyengmo Kha Ferry	.	.	.	.	18th	" "	1,000 " (B.P.)
Camp	.	.	.	.	19th	" "	—
Camp	.	.	.	.	20th	" "	2,200 ft
Lachin	.	.	.	.	21st	" "	2,700 "
Chino	.	.	.	.	22nd	" "	3,200 "
Chesyan	.	.	.	.	23rd	" "	3,000 "
Halt	.	.	.	.	24th	" "	—

Name or camp.					Date.	Height above sea-level.
Halt	.	.	.	.	25th April 1897	—
Kabap	.	.	.	.	26th „ „	2,800 „
Kepio	.	.	.	.	27th „ „	2,900 „
Mi-ok	.	.	.	.	28th „ „	3,800 „
Nong-wo	.	.	.	.	29th „ „	3,900 „
Mangkyi	.	.	.	.	30th „ „	—
Hong Kow	.	.	.	.	1st May „	5,100 „
Kyengmo	.	.	.	.	2nd „ „	4,570 „
Lakham	.	.	.	.	3rd „ „	4,100 „
Halt	.	.	.	.	4th „ „	—
Halt	.	.	.	.	5th „ „	—
Pak-kao	.	.	.	.	6th „ „	2,970 „

[ Here the party left the mules behind. ]

Chounglang	.	.	.	.	7th May 1897	3,850 „
Padè	.	.	.	.	8th „ „	3,750 „
Pashè	.	.	.	.	9th „ „	3,300 „
Woghrup (lower village)	.	.	.	.	10th „ „	3,650 „

[ From 9th May till 7th June no specimens could be collected. ]

Woghrup (upper village)	.	.	.	.	11th May 1897	4,350 „
Pong-chong	.	.	.	.	12th „ „	3,550 „
Chi-rang	.	.	.	.	13th „ „	—
Laking	.	.	.	.	14th „ „	3,700 „ ?
Tawlong	.	.	.	.	15th „ „	3,100 „ ?
Halt	.	.	.	.	16th „ „	—
Halt	.	.	.	.	17th „ „	—
Ngaw-yü	.	.	.	.	18th May 1897	—
Chong-teng	.	.	.	.	19th „ „	—

[ Here the return journey was commenced. ]

Ngaw-yü	.	.	.	.	20th May 1897	—
Tawlong	.	.	.	.	21st „ „	3,100 „
Halt	.	.	.	.	22nd „ „	—

[ Here the party was attacked at 3-30 A. M. ]

Cenak	.	.	.	.	23rd May 1897	—
Maghre	.	.	.	.	24th „ „	—
Camp	.	.	.	.	25th „ „	—
Camp	.	.	.	.	26th „ „	—
Camp	.	.	.	.	27th „ „	—

Name of camp.					Date.	Height above sea-level.
Camp	.	.	.	.	28th May 1897	—
Camp	.	.	.	.	29th " "	—
Khet-o-byi	.	.	.	.	30th " "	—
O-pa-tu	.	.	.	.	31st " "	—
Galeng	.	.	.	.	1st June "	—
Camp	.	.	.	.	2nd " "	—
Pe-lāp	.	.	.	.	3rd " "	—
Maru village	.	.	.	.	4th " "	—
Mo-wok	.	.	.	.	5th " "	—

[ Here the party rejoined the mules. ]

Halt	.	.	.	.	6th June 1897	—
Neo-chawng	.	.	.	.	7th " "	7,000 ft.
Camp	.	.	.	.	8th " "	2,500 "
Pāla	.	.	.	.	9th " "	1,500 "
Matè	.	.	.	.	10th " "	1,500 "
Chipwi Kha	.	.	.	.	11th " "	1,000 "
Myaungjong	.	.	.	.	12th " "	900 "
Camp	.	.	.	.	13th " "	800 "
on Tummao Kha	.	.	.	.	14th " "	700 "

[ From this point onwards to Myitkyina the mules took 14 days ; as the native collector accompanied the mules, Lieutenant Pottinger is unable to give precise localities for the specimens collected by his collector during this period : these specimens constitute the bulk of those marked Myitkyina (E) in the systematic list, as opposed to those marked Myitkyina (C) which, as already explained, were obtained by the Calcutta Garden native collector working under Lieutenant Cruddas. ]

Name of camp.					Date.	Height above sea-level.
Mokong	.	.	.	.	15th June 1897	600 ft.
Hankow	.	.	.	.	16th " "	500 "
Kakhying	.	.	.	.	17th " "	1,000 "
Myitkyina	.	.	.	.	18th " "	450 "

### § 3.—LIST OF THE PLANTS OBSERVED OR COLLECTED IN THE KACHIN HILLS DURING 1897.

[ *D. PRAIN and E. POTTINGER.* ]

In this list the identifications and distribution of the species communicated during 1897, whether by the expedition under Lieutenant Pottinger between March and June, or by the Garden collector working under Lieutenant Cruddas between June and December, are

given in detail. The identifications have been made by Dr. Prain, except in the case of the orchids; for identifying the majority of these and for checking the identifications of the remainder, we are under great obligations to Mr. R. Pantling and to Sir George King. The field notes, localities and elevations are supplied by Lieutenant Pottinger, who is also responsible for those notes regarding species seen but not collected that are given within square brackets; some of these bracketed identifications, we would desire it to be understood, are tentative only, and in no case is any species thus mentioned provided with a serial number in the list or employed in discussing the probable affinities of the flora. The precise localities of the Garden collector's specimens are not given; all are from within the Myitkyina district, though not necessarily from the immediate vicinity of the head-quarters of that district.

## PHANEROGAMIA

### DICOTYLEDONES.

#### *Thalamifloræ.*

#### I.—RANUNCULACEÆ.

##### 1. *Thalictrum foliolosum* DC.

Myitkyina (C). DISTRIB. Temperate Himalaya; Khasia and Naga Hills.

##### 2. *Anemone rivularis* Ham.

Neochawng (E). DISTRIB. Temperate Himalaya; Khasia and Naga Hills; mountains of S. India and Ceylon. A very distinct variety occurs on the Shan Plateau; the Kachin Hill plant is typical.

##### 3. *Clematis acuminata* DC.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Pegu.

[A *Clematis*, of which no specimens could be brought, was conspicuous on the mountain ranges between the upper waters of the La-king Kha and the Na-chawng Kha.]

#### II.—DILLENIACEÆ.

##### 4. *Dillenia pulcherrima* Kurz.

Myitkyina; a common scrubby tree (E); (C). DISTRIB. Pegu and the Shan Plateau.

#### III.—ANONACEÆ.

##### 5. *Unona dumosa* Roxb.

Myitkyina (C). DISTRIB. Sylhet and Assam; also the Malay Peninsula; our specimens are the first recorded from Burma.

6. *Goniothalamus peduncularis* King & Prain.

Myitkyina (C). A very distinct species, nearer to *G. Gardneri* and *G. Thwaitesii*, which are both Ceylon plants, than it is to any of the Indian species.

7. *Milusa macrocarpa* H. f. & T.

Bansparao, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Khasia Hills; never before reported from Burma.

#### IV.—MENISPERMACEÆ.

8. *Parabœna sagittata* Miers.

Namlao (E). DISTRIB. Eastern Himalaya; Khasia; Chittagong; Andamans; Pegu; South-West Yunnan (*Anderson*).

9. *Pericampylus incanus* Miers.

Namli, 2,000 ft. (E); Kakhying, 1000 feet (E). DISTRIB. Eastern Himalaya; Southern China; Indo-China; Malaya.

10. *Cyclea*? sp.

Namli, 2,000 ft. (E). DISTRIB. Taping Valley.

A very distinct plant, previously collected in the adjacent region of South-West Yunnan by Dr. J. Anderson, F.R.S. Neither Dr. Anderson's specimens nor ours have flowers or fruits, so that a name cannot be given to the species. In the Calcutta Herbarium both Mr. Kurz and Dr. King have referred the plant tentatively to *Cyclea*, and there is hardly room for doubt that it is an undescribed species of that genus. The subjoined description will show how different it is from any of the species hitherto published.

Leaves thinly membranous, peltate, ovate-rotund, entire, sparsely beset on both surfaces with long adpressed hairs, and with similar, but spreading, hairs fringing the leaf margins and clothing the very slender, somewhat wiry stems.

#### PAPAVERACEÆ.

[*Papaver somniferum* Linn.—Usually Kachin gardens contain a few plants of the opium Poppy. The collection and mode of smoking the drug have been described in the introductory chapter. The opium is used as a food-accessory and not as a narcotic; nevertheless there are among the Kachins some who do not smoke it, and who pride themselves on being non-smokers, just as certain Europeans make a boast of not using tobacco. No stigma attaches to the opium-smoker, and those Kachins who do not themselves use

the drug grow the plant and prepare the opium in order to employ it as a medium of exchange.]

## V.—CRUCIFERÆ.

11. *Brassica juncea* *H. f. & T. VAR. agrestis* (*Sinapis patens* Roxb.)

Myitkyina, a weed (C.). DISTRIB. Bengal, Assam, S. China.

[One of the usual garden-plants among the Kachins is a mustard grown for the sake of its edible leaves. No specimens were brought, but from Lieutenant Pottinger's description, it seems to be *Brassica rugosa* (*Sinapis rugosa* Roxb.). In the Nachawng Kha Valley the seeds of this plant are ground and mixed with the meal either of maize or millet and baked into an unleavened cake of a highly thirst-provoking and indigestible character.]

## VI.—CAPPARIDEÆ.

12. *Gynandropsis heptaphylla* DC.

Myitkyina (C). DISTRIB. All warm countries.

13. *Capparis sabinæfolia* *H. f. & T.*

Phalé, 1,300 to 3,300 feet (E). DISTRIB. Khasia and Naga Hills; also Chin Hills.

14. *Capparis tenera* *Dalz.*

Namlao (E). DISTRIB. Assam, Arracan and Andamans, also South India; with distinct varieties in Ceylon and in Tenasserim, respectively.

15. *Roydsia parviflora* *Griff.*

Namlao to Bansparao, 500 to 2,000 feet (E); Noichang to Phalé, 1,300 to 200 feet (E); Myitkyina (C). DISTRIB. Hukung Valley.

This very distinct species is now reported for the first time since its original discovery by Dr. Griffith, during his Assam-Ava journey. The Perak plant referred to this species in Dr. King's *Materials for a Flora of the Malayan Peninsula*, is quite distinct from the Kachin and Hukung Valley one.

16. *Cratæva lophosperma* *Kurz.*

Myitkyina (C). DISTRIB. Assam.

## VIOLARIEÆ.

[*Viola* spp.—Several different violets were met with while crossing the ranges between the head-waters of the La-khing Kha and Nachawng Kha, during the time that no specimens could be collected.]

VII.—POLYGALACEÆ.

17. *Salomonina cantoniensis* Lour.

Myitkyina (C). DISTRIB. Eastern Bengal; Sikkim; Assam; Burma; China; Malaya.

18. *Polygala arillata* Ham.

Myitkyina (C). DISTRIB. Southern India; Himalaya; Indo-China; China; Malaya. There are two distinct forms reported, one with simple racemes, the other with smaller firmer leaves and with the flowers in terminal thyrsoïd panicles.

19. *Polygala leptalea* DC.

Myitkyina (C.). DISTRIB. India from Himalayas to Ceylon; Indo-China; Nicobars; Australia. Not from Malaya or China so far.

20. *Securidaca tavoyana* Wall.

Myitkyina (C). DISTRIB. Assam; Burma; Malaya and China.

21. *Xanthophyllum glaucum* Wall.

Myitkyina (C). DISTRIB. Chittagong; Burma; Malaya; never before collected so far north.

VIII.—CARYOPHYLLACEÆ.

22. *Stellaria media* Linn.

Myitkyina, a weed (E). DISTRIB. A cosmopolitan weed.

IX.—HYPERICINEÆ.

23. *Hypericum patulum* Thunbg.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; also previously collected in the Taping Valley by Anderson.

X.—GUTTIFERÆ.

24. *Garcinia lanceæfolia* Roxb.

Myitkyina (C). DISTRIB. Assam and Silhet; not before reported from Burma.

XI.—TERNSTRÆMIACEÆ.

25. *Saurauja macrotricha* Kurz.

Myaungjong, 800 feet (E). DISTRIB. Khasia (Clarke); also previously collected by Dr. J. Anderson in the Taping Valley and by Dr. Griffith in the Hukung Valley.

26. *Saurauja Roxburghii* Wall.

Lamuk (E); Myitkyina (C). DISTRIB; Sikkim; Assam; Pegu.

27. *Camellia Thea Link.*

Occasionally found wild throughout the route, as at Shigu Ferry, etc., also two cultivated plants found in a Kachin garden at Lamuk, 2,500 feet (E). DISTRIB. Assam Ranges; Southern China.

28. *Anneslea fragrans Wall.*

Myitkyina (C). DISTRIB. Manipur; Shan Hills; Tenasserim.

29. *Eurya acuminata DC.* VAR. *euprista Korth.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China; Malaya.

## XII.—DIPTEROCARPEÆ.

30. *Shorea siamensis Miq.*

Namlao (E). DISTRIB: Pegu; Siam; not before collected so far north.

## XIII.—MALVACEÆ.

31. *Kydia calycina Roxb*

Myitkyina (C) DISTRIB. India; Himalaya; Assam and Burma.

32. *Abutilon indicum G. Don.*

Myitkyina (E). DISTRIB. A cosmopolitan tropical weed.

33. *Urena lobata Linn.*

Myitkyina (E). DISTRIB. A cosmopolitan tropical weed.

34. *Hibiscus cancellatus Roxb.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Burma.

35. *Hibiscus macrophyllus Roxb.*

Namlao (E). DISTRIB. Assam; Chittagong; and East Bengal; Tenasserim; Pegu and Malaya; not previously found so far north.

36. *Thespesia Lampas Dals. & Gibs.*

Myitkyina (C). DISTRIB. India from Himalaya southwards; Indo-China; Malayan Islands; East Tropical Africa.

37. *Bombax malabaricum DC.*

Myitkyina (C); Phalé, 1,300 to 3,300 feet (E). DISTRIB. India; Indo-China; S. China; Malaya; N. Australia.

[A species of *Gossypium* is generally cultivated by the Kachins; no specimens were brought. On the Chinese frontier two species of *Hibiscus*, one with large yellow, the other with red flowers, were seen, but specimens could not be preserved.]

## XIV.—STERCULIACEÆ.

38. *Sterculia coccinea Roxb.*

Myitkyina (E); banks of Tummao Kha, 700 feet (E); Nawgo Kha, 1,300 to 200 feet (E). DISTRIB. Himalaya; Assam Ranges; Indo-China.

39. *Sterculia cognata* *Prair.*

Myitkyina (C).

This is a very distinct species, perhaps nearest *S. Roxburghii* and its allies, but easily distinguished by its larger flowers and its sessile, narrow leaves.

40. *Sterculia colorata* *Roxb.*

Bansparao, 2,000 feet (E). DISTRIB. Throughout India and Indo-China.

41. *Helicteres glabriuscula* *Wall.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam and Burma.

42. *Helicteres Isora* *Linn.*

Myitkyina (C). DISTRIB. India and Malaya, not before reported from Burma and not sent from Assam.

43. *Buettneria pilosa* *Roxb.*

Namlao to Bansparao, 500 feet to 2,000 feet (E); Myitkyina (C). DISTRIB. Assam; Chittagong and Burma.

#### XV.—TILIACEÆ.

44. *Grewia elastica* *Royle.*

Myitkyina (C). DISTRIB. Himalaya; Cachar and Burma. Reduced by Masters in *Flora of British India* to *G. asiatica* Linn., as a variety (VAR. *vestita*), but better kept separate.

45. *Grewia hirsuta* *Vahl.*

Myitkyina (E); (C). DISTRIB. Throughout India, not before sent from the Eastern Peninsula, but nevertheless exactly like the Indian plant.

46. *Grewia sapida* *Roxb.*

Myitkyina (C). DISTRIB. Himalaya and Assam, not before sent from Burma.

47. *Triumfetta pilosa* *Roth.*

Myitkyina (C). DISTRIB. India; Indo-China; China Malaya; Africa.

48. *Elæocarpus Braceanus* *Watt.*

Myitkyina (C). DISTRIB. Manipur, (*Watt, Clarke*).

#### *Discifloræ.*

#### XVI.—LINEÆ.

49. *Reinwardtia trigyna* *Planch.*

Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya.

XVII.—MALPIGHIACEÆ.

50. *Hiptage candicans* *H.f. & T.*

Namlao (E). DISTRIB. Manipur; Burma.

XVIII.—GERANIACEÆ.

51. *Impatiens bella* *H.f. & T.*

Myitkyina (C). DISTRIB. Khasia and Naga Hills, not before recorded from Burma.

52. *Impatiens latiflora* *Roxb.?*

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges.

This is smaller than the typical plant, and may prove specifically distinct, but the material is insufficient for absolute determination. If new, its affinity is most marked with the species mentioned. Exactly the same plant has been collected by Dr. J. Anderson in the Taping Valley.

53. *Impatiens leptoceras* *DC.*

Myitkyina (C). DISTRIB. Himalaya and Assam Ranges; not before sent from Burma.

54. *Impatiens puberula* *DC.*

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges; not before sent from Burma.

[ Many other Balsams were seen during the journey across the two mountain ranges at the head-waters of the Lakhing Kha and of the Nachawng Kha. ]

XIX.—RUTACEÆ.

55. *Clausena excavata* *Burm.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Indo-China; Malaya.

56. *Micromelum pubescens* *DC.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Indo-China; Malaya; also Ceylon.

57. *Zanthoxylum acanthopodium* *DC.*

Myitkyina (C). DISTRIB. Eastern Himalaya and the Assam Ranges; previously sent by Mr. C. R. Dun from the Chin Hills, but not reported from any other part of Burma.

58. *Zanthoxylum ovalifolium* *Wight.*

Myitkyina (C). DISTRIB. India; Eastern Himalaya and the Assam Ranges; not previously reported from Burma.

59. *Toddalia aculeata* *Pers*

Myitkyina (C). DISTRIB. India ; Indo-China ; China ; Malaya.

60. *Acronychia laurifolia* DC.

Myitkyina (C). DISTRIB. India ; Indo-China ; China ; Malaya.

61. *Citrus Aurantium* Linn.

Myitkyina (E), cultivated. DISTRIB. Doubtfully wild in the Eastern Himalaya.

62. *Citrus medica* Linn.

Myitkyina (C) ; Lammuk, wild (E). DISTRIB. India ; Indo-China ; Eastern Himalaya.

## XX.—SIMARUBEÆ.

63. *Brucea mollis* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Karen Hills and mountains of Tenasserim.

## XXI.—BURSERACEÆ.

64. *Garuga pinnata* Roxb.

Ngaw-yü, 5,000 feet (E). DISTRIB. India ; Indo-China ; Malaya.

65. *Protium serratum* Engl. ( *Bursera serrata* Wall.)

Myitkyina (C). DISTRIB. South India ; Central India ; Assam ; Burma. The *Index Kewensis* accepts the name *Protium serratum* Engler, as the correct designation for the tree better known in India as *Bursera serrata*.

## XXII.—MELIACEÆ.

66. *Dysoxylum grande* Hiern ?

Myitkyina (C). DISTRIB. Assam ? The specimens are in fruit only and cannot be definitely determined.

67. *Lansium decandrum* Harms. ( *Amoora decandra* Hiern. )

Neo-chawng, 700 feet (E). DISTRIB. Eastern Himalaya ; absent from the Assam Ranges. Said also to be present in the Malayan Peninsula, but this is doubtful.

68. *Cedrela Toona* Roxb.

Myitkyina (E). (C). DISTRIB. Himalaya India ; Indo-China ; Malay Archipelago.

## XXIII.—OLACINEÆ.

69. *Olex acuminata* Wall.

Namlao to Bansparao, 500 to 2,000 feet, (E). DISTRIB. Bhutan ; Assam Ranges ; previously obtained by Dr. J. Anderson in the Taping Valley, but not elsewhere in Burma.

70. *Schœpfia fragrans* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya and the Assam Ranges ; not before collected in Burma.

71. *Cardiopteris lobata* R. Br.

Myitkyina (C). DISTRIB. Indo-China from Silhet eastwards ; Malaya. Previously obtained by Dr. J. Anderson in the Taping Valley.

### ILICINEÆ.

[An *Ilex* with leaves like the European Holly (and therefore not improbably *Ilex dipyrrena*) was observed during the marches across the mountains between the upper reaches of the La-khing Kha and the Nachawng Kha.]

### XXIV.—CELASTRINEÆ.

72. *Celastrus paniculata* Willd.

Myitkyina (C). DISTRIB. India ; Indo-China and Malaya.

73. *Microtropis discolor* Wall.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Tenasserim.

74. *Gymnosporia pallida* Coll. & Hemsl.

Myitkyina (C). DISTRIB. Shan Plateau.

### XXV.—RHAMNEÆ.

75. *Zizyphus rugosa* Lamk.

Myitkyina (E). DISTRIB. India ; Himalaya ; Indo-China.

76. *Zizyphus* ? ? sp.

Myitkyina (C). DISTRIB. Taping Valley.

A very distinct plant, originally obtained by Dr. J. Anderson, F. R. S., in the Taping Valley, South-West Yunnan. Dr. Anderson's example, which is without flower or fruit, has been identified by Mr. Kurz with *Z. Cenoplia*. Our specimens, which are in fruit only, show that the plant is certainly not *Z. Cenoplia* ; and almost certainly not a *Zizyphus* ; if a *Zizyphus*, it belongs to no species hitherto described. Till flowering specimens are received, however, it seems better to locate the plant where Mr. Kurz has tentatively placed it.

77. *Rhamnus nipalensis* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges and Shan Hills.

### XXVI.—AMPELIDEÆ.

78. *Vitis augustifolia* Wall.

Phalé (E). DISTRIB. Assam ; Silhet ; Tenasserim ; Sumatra.

79. *Vitis lanceolaria* Roxb.

Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.

80. *Vitis oxyphylla* Wall. ( *V. dubia* Laws.)

Namlao to Bansparao, 500 to 2,000 feet (E). DISTRIB. E. Himalaya ; Assam and Chittagong ; not before sent from Burma.

81. *Vitis repens* W. & A.

Myitkyina (C). DISTRIB. Eastern Himalayas ; Indo-China ; Malaya. There are also examples of a plant from Southern India, in the Calcutta Herbarium, that are doubtfully referable to this species.

#### XXVII.—SAPINDACEÆ.

82. *Allophylus Cobbe* DC. VAR. *glabra* Roxb. (sp.)

Myitkyina (C). DISTRIB. ( of the variety ) India ; Indo-China ; China ; Malaya.

83. *Lepisanthes burmannica* Kurz.

Myitkyina (C). DISTRIB. Pegu and Tenasserim.

[ *Nephelium Litchi* Camb.—The Litchi fruit was obtained at a village in the hills immediately east of 'Nsentaru Ferry ; the quality was rather indifferent ; the tree was not met with further north. ]

#### XXXVIII.—SABIACEÆ.

84. *Meliosma simplicifolia* Roxb.

Shigu Ferry, 800 feet, (E). DISTRIB. Southern India ; Himalaya ; Indo-China.

#### ANACARDIACEÆ.

[ *Mangifera indica* Linn.—The mango is cultivated sparingly in the lower villages as far north as the confluence, but the fruit is not of very good quality.]

#### *Caiyciflorae.*

#### XXIX.—CONNARACEÆ.

85. *Tæniochlæna birmanica* Prain.

Myitkyina (C).

A very distinct species ; the only other species of the genus is Malayan.

#### XXX.—LEGUMINOSÆ.

86. *Crotalaria alata* Ham.

Myitkyina (E). DISTRIB. India ; Indo-China ; Malaya.

87. *Crotalaria ferruginea* Wall.

Nawgo Kha, 1,300 to 2,000 ft. (E) ; Myitkyina (C). DISTRIB. Himalaya ; Indo-China ; Malaya : also Ceylon. Not reported from India.

The Nawgo Kha examples are typical ; those from Myitkyina are much less hirsute and are not at all ferrugineously tomentose.

88. *Indigofera atropurpurea* Ham. VAR. *nigrescens*.

Myitkyina (C). DISTRIB. (of the variety) Khasia Hills ; Taping Valley and Shan Plateau.

This is the form for which Mr. Kurz has proposed the name *Indigofera nigrescens* ; it has much smaller flowers and thinner leaflets than the true plant and doubtless deserves the specific rank which Kurz claims for it.

89. *Millettia pachycarpa* Bth.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Tenasserim.

90. *Millettia puerarioides* Prain.

Maté, 1,500 ft. (E) ; Myitkyina (C). DISTRIB. E. Indo-China.

91. *Millettia pulchra* Benth.

Myitkyina (E). DISTRIB. Assam Ranges ; also previously collected by Anderson in the Taping Valley, but not reported from elsewhere in Burma.

92. *Wistaria chinensis* Sieb. & Zucc.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. China. Introduced to Japan from China and thence to Europe. Even in China the localities where this is wild seem doubtful ; Lieutenant Pottinger points out that there is no doubt about its being wild here. Not previously recorded from any Indian or Indo-Chinese locality.

93. *Desmodium cephalotes* DC.

Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.

The specimens belong to typical *D. cephalotes*.

94. *Desmodium gangeticum* DC.

Myitkyina (E). DISTRIB. A weed everywhere in the tropics of the Eastern Hemisphere ; introduced also in the West Indies.

95. *Desmodium gyroides* DC.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Indo-China ; China ; Malaya ; also Ceylon, but not in India proper.

96. *Desmodium latifolium* DC.

Myitkyina (C). DISTRIB. A weed throughout the tropics of the Eastern Hemisphere ; introduced in the West Indies.

97. *Desmodium laxiflorum* DC.

Myitkyina (C). DISTRIB. General throughout South-Eastern Asia.

98. *Desmodium oblongum* Wall.

Myitkyina (C). DISTRIB. Shan Plateau ; Karen Hills.

99. *Desmodium oxyphyllum* DC.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; China and Japan.

This is *D. podocarpum* Baker, in part, of the *Flora of British India* (*D. japonicum*, Miq.) and not the *D. oxyphyllum* of the *Flora of British India*.

100. *Desmodium parvifolium* DC.

Myitkyina (C). DISTRIB. India; Indo-China; Himalaya; Malayan Archipelago; China and Japan.

101. *Desmodium polycarpum* DC.

Myitkyina (C). DISTRIB. Throughout the tropics of the Eastern Hemisphere and Polynesia.

102. *Desmodium pseudo-triquetrum* DC.

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges; never before collected in Burma. This does not occur in India proper or in Indo-China and has not been as yet collected in China.

103. *Desmodium pulchellum* Bth.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia. Collected both by Griffith in the Hukung Valley and by Anderson in the Taping Valley.

104. *Desmodium Scalpe* DC.

Myitkyina (C). DISTRIB. South India; Manipur; Malay Islands; Africa.

A curiously detached distribution, for the plant has not as yet been recorded from anywhere in Assam except Manipur, nor from anywhere in Burma except the Kachin Hills, and does not appear to occur in the Himalayas. It is common in Africa, in Peninsular India, and in the Malay Archipelago.

105. *Desmodium tiliaefolium* G. Don.

Myitkyina (C). DISTRIB. Himalaya.

106. *Desmodium triquetrum* DC.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. India; Indo-China; China; Malaya. This has never been found in the Himalayan region.

107. *Uraria crinita* Desv.

Namlao (E); Myitkyina (C). DISTRIB. Tropics of the Eastern Hemisphere; though said by Baker to come both from the Himalaya and from India, there are no specimens from either region in the Herbarium at Calcutta.

108. *Uraria hamosa* Wall.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

109. *Uraria lagopoides* DC.

Myitkyina (C). DISTRIB. Assam; Burma; Malaya; China; Australia. This occurs also in Lower Bengal, but not elsewhere in India proper.

110. *Uraria picta* Desv.

Myitkyina (C). DISTRIB. Tropics of the Eastern Hemisphere.

111. *Lespedeza parviflora* Kurz.

Myitkyina (C). DISTRIB. Shan Plateau, Karen Hills.

112. *Abrus pulchellus* Wall.

Myitkyina (C). DISTRIB. Himalaya, Indo-China, Malaya, also Ceylon, but not in India proper.

113. *Shuteria vestita* W. & A.

Myitkyina (C). DISTRIB. India; Himalaya; Indo-China; Malaya.

114. *Erythrina stricta* Roxb.

Namli, 2,000 ft. (E). DISTRIB. India from Rajputana to Orissa; Assam; Burma and Chittagong; not in the Himalayas.

115. *Mucuna macrocarpa* Wall.

Namli, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Shan Hills.

A creeper with stems as thick as a man's thigh, flowers on old wood (*Pottinger*). Previously collected by Dr. Anderson at Poneshee in the Taping Valley.

116. *Spatholobus Pottingeri* Prain.

Namli, 2,000 to 2,500 ft. (E).

A very fine species nearest to the Malayan *S. ferrugineus* and *S. gyrocarpus*.

117. *Cruddasia insignis* Prain.

Myitkyina (C).

A very distinct plant with most of the characters of a *Pueraria*, except that its leaves are 5-foliolate, and that it has a penicillate stigma.

118. *Pueraria bella* Prain.

Myitkyina (C).

A very distinct species, apparently nearest *P. Thunbergiana*.

119. *Pueraria Candollei* Grah.

Namlao (E). DISTRIB. Chittagong; Pegu and Tenasserim.

120. *Pueraria phaseoloides* Bth. VAR. *javanica* Bak.

Myitkyina (C). DISTRIB. (of the variety), India and Malaya Assam; not before recorded from Burma.

121. *Pueraria subspicata* Bth.

Myitkyina (C). DISTRIB. Eastern Himalaya and Indo-China from Assam eastwards.

122. *Pueraria Thunbergiana* Bth.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; China and Japan.

123. *Canavalia ensiformis* DC., VAR. *virosa* Bak.

Myitkyina (C). DISTRIB. India ; Indo-China and Malaya.

124. *Phaseolus calcaratus* Roxb.

Myitkyina (C) DISTRIB. India : Himalaya ; Indo-China ; Malaya.

125. *Vigna pilosa* Bak.

Myitkyina (E). DISTRIB. India ; Himalaya ; Indo-China.

126. *Dolichos Lablab* Linn.

Myitkyina (E). DISTRIB. Throughout the tropics of the Old World.

Cultivated throughout the Kachin Hills.

127. *Dunbaria fusca* Kurz.

Myitkyina (C). DISTRIB. Prome.

A very interesting re-discovery of one of Dr. Wallich's Burmese species.

128. *Flemingia congesta* Roxb.

Phalé, 1,300 to 3,300 ft. (E). DISTRIB. India ; Himalaya ; China ; Indo-China ; Malaya.

The true plant described and figured by Roxburgh.

129. *Flemingia semialata* Roxb.

Myitkyina (E) ; (C) ; Namlao (E). DISTRIB. India ; Himalaya ; Assam Ranges.

This had not previously been collected east of the Assam ranges of mountains.

130. *Dalbergia Kingiana* Prain.

Myitkyina (C).

A fine species, nearest to, but very distinct from, *Dalbergia Benthamiana* Prain. (*D. rubiginosa* Benth. in *Flora of Hongkong*, not of Roxburgh in *Flora Indica*, or of Baker in *Flora of British India*).

131. *Dalbergia rimosa* Roxb.

Myitkyina (C). DISTRIB. Eastern Himalaya and throughout the Assam Ranges, but not previously collected in Burma.

132. *Dalbergia stipulacea* Roxb.

Myitkyina (C). DISTRIB. Eastern Himalaya, Assam Ranges, and Upper Burma.

133. *Derris latifolia* Prain.

Myitkyina (C).

A very distinct species, nearest *D. Wallichii*.

134. *Mezoneuron cucullatum* W. & A.

Myitkyina (C). DISTRIB. India ; Himalaya ; Assam ; Burma.

135. *Cassia Fistula* Linn.

Neochawng, 2,500 ft. (E). DISTRIB. India ; Indo-China ; Malaya.

136. *Cassia nodosa* Ham.

Myitkyina (E). DISTRIB. Assam Ranges; Indo-China; Malaya; said by Mr. Baker to occur in the Eastern Himalaya, but there are no examples at Calcutta from north of the Brahmaputra.

137. *Bauhinia Pottingeri* *Prain*.

Namlao to Bansparao, 500 to 2,000 ft. (E).

A very fine species, belonging to the group that includes *B. ferruginea* and *B. nervosa*, but with rather larger flowers than any hitherto known member of its group.

138. *Bauhinia variegata* *Linn*.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. India; Himalaya; Indo-China; China.

139. *Calliandra umbrosa* *Bth*.

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges; also reported from the Chin Hills, but not from the country east of the Irrawaddy Valley.

140. *Acacia pennata* *Willd*.

Bansparao, 2,000 ft. (E). DISTRIB. India; Indo-China; Malaya.

141. *Acacia pruinescens* *Kurz*.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Upper Assam; also previously collected both by Dr. Griffith in the Hukung Valley and by Dr. Anderson at Poneshee in the Taping Valley.

142. *Albizia lucida* *Bth*.

Myitkyina (C). DISTRIB. Himalaya; Assam; Burma; Tenasserim.

143. *Pithecolobium angulatum* *Bth*.

Myitkyina (C). DISTRIB. Eastern Himalaya; Indo-China and Malaya.

144. *Pithecolobium bigeminum* *Mart*.

Palā, 1,500 ft. (E); Myitkyina (C). DISTRIB. W. India; E. Himalaya and Assam; not before collected in Burma.

[Peas were found cultivated in the villages on the Chinese frontier, and other beans besides the *Sím* (*Dolichos Lablab*) were noticed in gardens during the journey.]

### XXXI.—ROSACEÆ.

145. *Prunus acuminata* *Wall*.

Myitkyina (C). DISTRIB. Himalaya; Assam; not before sent from Burma.

[*Prunus Armeniacæ* *Linn*.—The Apricot was very often seen during the journey; no specimens were brought. The Apricot occurs also among Dr. Anderson's specimens from Momien in the Taping Valley.]

146. *Prunus persica* Linn.

Shigu Ferry, 2,500 ft.; cultivated (E). Grown in the cooler parts of India.

The Peach was seen in other places also, but was by no means so common as the Apricot. This likewise occurs among Dr. Anderson's specimens from Momien and elsewhere in the Taping Valley.

147. *Prunus Puddum* Roxb.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China.

148. *Neillia thyrsoflora* Don.

Myitkyina (C). DISTRIB. Eastern Himalaya; Khasia; Manipur; also Java; not before collected in Burma.

149. *Rubus hexagynus* Roxb.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Shan Plateau; also previously collected in the Taping Valley.

[Various other species of *Rubus*, among them, to judge by Lieutenant Pottinger's notes, *R. moluccanus* and *R. rosæfolius*, were common.]

[*Fragaria indica* Linn.—This was very frequently met with during the journey, but no specimen was collected.]

[*Fragaria elatior* Ehrh.—This was plentiful in the high ranges, between the head-waters of the Lakhing Kha and the Nachawng Kha, but no examples could be brought.]

150. *Potentilla Kleiniana* Wight.

Phalé, 1,300 to 3,300 ft. (E). DISTRIB. India; Indo-China; Malaya; China; previously collected by Dr. Anderson at Poneshee in the Taping Valley.

151. *Agrimonia Eupatorium* Linn.

Myitkyina (C). DISTRIB. Himalaya; Indo-China; China; Northern Asia; Japan; doubtfully reported from Java.

152. *Rosa involucrata* Roxb.

Myitkyina (E) DISTRIB. India; Assam; Burma.

[*Docynia indica* DCne.—This was very common everywhere throughout the Kachin Hills.]

153. *Photinia Notoniana* W. & A., VAR. *macrophylla* Hook. f.

Myitkyina (C). DISTRIB. (of the variety), Khasia Hills; not before sent from Burma.

### XXXII.—SAXIFRAGACEÆ.

154. *Hydrangea robusta* H. f. & T., VAR. *Griffithii* Clarke.

Myitkyina (C). DISTRIB. East Himalaya. This would be better considered a distinct species.

155. *Hydrangea Pottingeri* *Prain*.

Lakham, 4,100 ft. (E).

A very distinct species.

156. *Dichroa febrifuga* *Lour.*

Myitkyina (C). DISTRIB. Himalaya : Assam ; Malaya ; China ; Indo-China.

157. *Escalloniearum* genus novum.

Chesyan, 3,000 ft. (E.)

A plant that forms the type of a very distinct new genus near to *Itea*. The solitary example is in fruit, and as the petals have fallen and the anthers have dropped, the publication of a diagnosis is for the moment deferred.

158. *Itea macrophylla* *Wall.*

Palā, 1500 ft. (E) ; Myaungjong 600 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; Malaya ; not before collected in Burma.

### XXXIII.—HAMAMELIDEÆ.

159. *Altingia excelsa* *Noronha*.

Myitkyina (E). DISTRIB. Eastern Himalaya ; Yunnan ; Indo-China ; Malaya.

### XXXIV.—COMBRETACEÆ.

160. *Terminalia argyrophylla* *King & Prain*.

Myitkyina (C).

A very striking new species, noted as being a "timber-tree" by the Garden collector.

161. *Terminalia Chebula* *Retz.*

Myitkyina (C). DISTRIB. India, Indo-China, Malaya.

162. *Terminalia myriocarpa* *Henk. & Muell.*

Myitkyina (C). DISTRIB. Himalaya ; Assam ; Upper Burma,

163. *Calycopteris floribunda* *Wall.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. India, Indo-China, Malaya, not in the Himalayan Ranges.

### XXXV.—MYRTACEÆ.

164. *Eugenia claviflora* *Roxb.*

'Nsentarū, 600 ft. (E). DISTRIB. Malaya and Indo-China ; not previously found so far north.

165. *Eugenia Griffithii* *Duthie.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Khasia Hills plentiful. Founded on Griffith, 2,375, which is said to have come from Malacca but may be from the Hukung Valley, Griffith's Burmese and Malayan specimens having become somewhat confused.

166. *Eugenia obvata* Wall.

Myitkyina (C). DISTRIB. Himalaya; Assam; Indo-China. Mr. Duthie considers this only a distinct variety of *E. operculata* Roxb.

### XXXVI.—MELASTOMACEÆ.

167. *Osbeckia chinensis* Linn.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; China and Japan; Australia.

168. *Melastoma malabathricum* Linn.

Nawgo Kha, 1,300 to 2,000 ft. (E); Myitkyina (C). DISTRIB. India; Himalaya; Assam. The true plant; not before found in Burma.

169. *Melastoma normale* Don.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China.

170. *Oxyspora paniculata* DC.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges.

171. *Sonerila maculata* Roxb.

Myitkyina (C). DISTRIB. Himalaya; Indo-China.

### XXXVII.—LYTHRARIÆ.

172. *Woodfordia floribunda* Salisb.

Myitkyina; seeds used to make bird-lime (E). DISTRIB. India; Indo-China; China; Africa.

173. *Lagerstrœmia parviflora* Roxb., VAR *bengalensis* Clarke.

Myitkyina (C). DISTRIB. (of the variety), Eastern Himalaya; Assam; also previously obtained by Dr. Griffith in the Hukung Valley, but not elsewhere in Burma.

174. *Punica Granatum* Linn.

Myitkyina; cultivated (E). DISTRIB. Cultivated in most warm countries. Wild from North-Western India to Persia.

### XXXVIII.—SAMYDACEÆ.

175. *Casearia graveolens* Dals.

Myitkyina (C). DISTRIB. India; Himalaya; Assam; Burma.

### XXXIX.—CUCURBITACEÆ.

176. *Hodgsonia heteroclita* H. f. & T.

Nawgo Kha, 1,300 to 2,000ft. (E). DISTRIB. Eastern Himalaya; Assam; Indo-China; Malaya.

177. *Trichosanthes palmata* Roxb.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; previously collected by Dr. Anderson at Mynela in the Taping Valley.

178. *Trichosanthes Wallichiana* Wight.

Myitkyina (C). DISTRIB. India; Himalaya; Assam; China; Burma, Malaya. This is the *T. multiloba* of the *Flora of British India*, but not the true *T. multiloba* Miq.

179. *Gymnopetalum cochinchinense* Kurz.

Myitkyina (C). DISTRIB. East Himalaya; Assam; Burma; Malaya, Cochin-China; China. Mr. Clarke also records it from Chota Nagpur.

180. *Thladiantha Hookeri* C. B. Clarke.

Myitkyina (C). DISTRIB. Cachar, Khasia and Naga Hills; not before sent from Burma.

181. *Alsomitra pubigera* Prain.

Myitkyina (C). A very distinct species, with velvety petioles and fruits.

#### XL.—BEGONIACEÆ.

182. *Begonia barbata* Wall.

Myitkyina (E). DISTRIB. Eastern Himalaya and the Assam Ranges; Burma.

183. *Begonia gigantea* Wall.

Myitkyina (E). DISTRIB. Eastern Himalaya and the Assam Ranges, common: not before sent from Burma.

[Several other species of *Begonia* were seen but specimens could not be brought.]

#### XLI.—UMBELLIFERÆ.

184. *Hydrocotyle javanica* Thunbg.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and in Eastern Africa.

185. *Heracleum Wallichii* DC.

Myitkyina (C). DISTRIB. Central and Eastern Himalaya.

#### XLII.—ARALIACEÆ.

186. *Aralia armata* Seem.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam; Kedah; and Tenasserim. Not before collected so far north.

187. *Heptapleurum Lawranceanum* Prain.

Lakham, 4,100 ft. (E). A very distinct species of the section *Agalma*.

XLIII.—CORNACEÆ.

188. *Marlea begoniæfolia* *Roxb.*  
 Myitkyina (C). DISTRIB. Northern India; Assam and Burma;  
 China; and Japan.  
 189. *Mastixia euonymoides* *Prain.*  
 Myitkyina (C). A very fine and distinct new species.  
 190. *Alangium Kingianum* *Prain.*  
 Myitkyina (C). A very distinct species, most nearly related to  
*A. Faberi* Oliv.

*Corollifloræ.*

XLIV.—CAPRIFOLIACEÆ.

191. *Sambucus javanica* *DC.*  
 Myitkyina (C). DISTRIB. Assam; Indo-China; China; Malaya.  
 Previously sent from the Taping Valley by Anderson.  
 192. *Viburnum coriaceum* *DC.*  
 Myitkyina (C). DISTRIB. Himalaya; Indo-China; Malaya. Pre-  
 viously sent from the Taping Valley by Anderson.  
 193. *Lonicera japonica* *Thunbg.*  
 Myitkyina (C). DISTRIB. China; Japan; also Assam (Naga Hills,  
*Dr. Watt.*)

XLV.—RUBIACEÆ.

194. *Adina sessilifolia* *Hook. fil.*  
 Myitkyina (C). DISTRIB. Cachar; Chittagong; Prome.  
 195. *Uncaria macrophylla* *Wall.*  
 Myitkyina (C). DISTRIB. Eastern Himalaya and Assam.  
 196. *Uncaria sessilifructus* *Roxb.*  
 Myitkyina (C). DISTRIB. Eastern Himalaya; Assam and Indo-China.  
 197. *Luculia gratissima* *Wall.*  
 Myitkyina (C). DISTRIB. Himalaya; Burma.  
 198. *Wendlandia paniculata* *DC.*  
 Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Assam;  
 Burma; Malay; China.  
 199. *Wendlandia tinctoria* *DC.*  
 Myitkyina (E). DISTRIB. Northern India and Himalaya; Assam;  
 Burma; doubtfully in Java.  
 200. *Hedyotis capitallata* *Wall.*  
 Myitkyina (C). DISTRIB. Manipur; Shan Hills; Tenasserim,  
 Malaya; also previously collected in the Taping Valley, but not  
 elsewhere in Yunnan.

201. *Hedyotis hispida* Retz.

Myitkyina (C). DISTRIB. India ; Indo-China ; China ; Malaya.

202. *Hedyotis scandens* Roxb.

Myitkyina (C). DISTRIB. Himalaya ; Assam ; Chittagong. Already collected by Anderson in the Taping Valley, but not before in Upper Burma.

203. *Anotis ingrata* Hook. fl.

Myitkyina (C). DISTRIB. Himalaya and the Assam Ranges ; not before collected in Burma.

204. *Spiradiclis cylindrica* Hook. fl.

Myitkyina (C). DISTRIB. Assam Ranges ; not before collected in Burma.

205. *Ophiorrhiza Harrissiana* Heyne, VAR. *argentea* Hk. f.

Ningting, 3,000 ft. (E) ; Myitkyina (C). DISTRIB. (of the variety), India ; Assam ; not before obtained in Burma.

206. *Ophiorrhiza hispida* Hook. fl.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Khasia Hills ; Cachar ; Makum Forest ; not before obtained in Burma.

207. *Ophiorrhiza Kingiana* Prain.

Myitkyina (C).

A distinct species, nearest *O. lurida* Hook. f.

208. *Carlemannia Griffithii* Benth.

Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges ; not before collected in Burma.

[*Mussaenda macrophylla* Wall.—This was plentiful in the lower hills ; no specimens were brought.]

209. *Mussaenda Roxburghii* Hook. f.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma.

210. *Mussaenda* sp.

Myitkyina (E).

Of this very distinct plant only one specimen has been reported ; though insufficient for descriptive purposes, it suffices to show that it is very distinct from any of the Indian, Indo-Chinese, or Chinese species represented in Herb. Calcutta. It most resembles *M. pavettæflora* Kurz, and is evidently nearly allied thereto, but the young corollas are adpressed grey-silky, whereas in *M. pavettæflora* these are quite glabrous.

211. *Randia Wallichii* Hook. f.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Indo-China ; Malay Archipelago ; also previously collected in the Taping Valley.

212. *Gardenia erythroclada* Kurz.

Myitkyina (C). DISTRIB. Pegu.

213. *Coffea Jenkinsii* Hook. f.

Neochawng, 2,500 to 7,000 ft. (E); Myitkyina (C) DISTRIB. Assam Ranges; not before sent from Burma.

214. *Morinda augustifolia* Roxb.

Namlao to Bansparao, 500 to 2,000 ft. (E); Maté, 1,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

215. *Psychotria adenophylla* Wall.

Banks of Tummao Kha, 700 ft. (E); Myitkyina (E). DISTRIB. Assam Ranges; Chittagong; Burma; Andamans.

216. *Psychotria calocarpa* Kurz.

Banks of ' Nmai Kha, 900 ft. (E); Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

217. *Psychotria erratica* Hook. f.

Neochawng, 2,500 ft. (E). DISTRIB. Eastern Himalaya and Assam Ranges; not before sent from Burma.

218. *Chasalia curviflora* Thw.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

219. *Lasianthus Wallichii* Wight.

Myitkyina (C), DISTRIB. Assam; Burma; Andamans; China; Malaya (a distinct variety).

220. *Pæderia Cruddasiana* Prain.

Myitkyina (C).

A very distinct new species of the group with fruits not compressed.

## XLVI.—COMPOSITÆ.

221. *Vernonia arborea* Ham.

Myitkyina (E). DISTRIB. India; Assam; Indo-China; Malaya.

222. *Vernonia cinerea* Less.

Myitkyina (E); (C). DISTRIB. Throughout the Tropics of the Eastern Hemisphere.

223. *Vernonia scandens* DC.

Namlî, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Burma.

224. *Vernonia volkameriæfolia* DC.

Myitkyina (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China.

225. *Adenostemma viscosum* Forst., VAR. *elata* Clarke.

Myitkyina (C). DISTRIB. Throughout the Tropics.

226. *Dichrocephala latifolia* DC.

Myitkyina (C). DISTRIB. Tropics of Old World.

227. *Blumea balsamifera* DC.

Myitkyina, 450 ft. (E). DISTRIB. Eastern Himalaya ; China ; Indo-China ; Malaya.

228. *Blumea chinensis* DC.

Myitkyina (E). DISTRIB. Eastern Himalaya ; China ; Indo China ; Malaya.

229. *Blumea myriocephala* DC.

Namlao (E). DISTRIB. Eastern Himalaya ; Indo-China ; China.

230. *Lagera flava* Benth.

Myitkyina (C). DISTRIB. General in South-Eastern Asia, in the drier parts.

231. *Gnaphalium indicum* Linn.

Myitkyina (E). DISTRIB. Drier parts of Tropics of Old World.

232. *Vicoa auriculata* Cass.

Myitkyina (E). DISTRIB. Drier regions of India and Indo-China.

233. *Cotula hemisphærica* Wall.

Myitkyina (E). DISTRIB. Rice-fields of Northern India, and of Assam, Burma and China.

234. *Spilanthes Acmella* Linn., VAR. *calva* Clarke.

Myitkyina (C). DISTRIB. Throughout the warmer parts of India and Indo-China.

235. *Artemisia vulgaris* Linn.

Myitkyina and elsewhere, up to 5,000 ft. (E) ; (C). DISTRIB. Temperate parts of Europe and Asia.

236. *Senecio araneosus* DC.

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. India ; Himalaya ; Assam Ranges, not before collected in Burma.

237. *Senecio yunnanensis* Watt. MSS. in *Herb. Calcutta*.

Myitkyina (C). DISTRIB. Upper Assam (*Simons*) and Taping Valley (*J. Anderson*). Both Mr. Clarke and Mr. Kurz have included this in *S. vagans*, which in externals it closely resembles.

238. *Emilia prenanthoidea* DC.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges. Previously collected by Anderson in the Taping Valley, but not elsewhere in Burma.

#### XLVII.—CAMPANULACEÆ.

239. *Pratia begonifolia* Lindl.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; China ; Indo-China ; Malaya.

240. *Lobelia affinis* Wall.

Namlao (E) ; Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; China ; Indo-China ; Malaya.

241. *Lobelia rosea* Wall.

Myitkyina (C). DISTRIB. Himalaya ; Assam ; Burma.

242. *Wahlenbergia gracilis* DC.

Myitkyina (C). DISTRIB. Tropics of Old World.

243. *Campanumœa parviflora* Bth.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Shan Plateau.

#### XLVIII.—VACCINIACEÆ.

244. *Agapetes Pottingeri* Prain.

Lakham, 4,100 ft. (E).

A very distinct species, forming the type of a new section of *Agapetes*.

245. *Desmogyne neriiifolia* King & Prain.

Myitkyina (C). DISTRIB. Chin Hills.

#### XLIX.—ERICACEÆ.

246. *Pieris ovalifolia* Don.

Hankow, 500 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; Indo-China ; China ; Japan.

247. *Rhododendron indicum* Linn.

Ningting, 800 ft. (E). DISTRIB. China and Japan ; also previously collected by Dr. J. Anderson at Momien in the Taping Valley.

[Several *Rhododendrons* were met with while crossing the mountains between the head-waters of the Lakhing Kha and the Nachawng Kha.]

#### L.—PRIMULACEÆ.

248. *Lysimachia evalvis* Wall., VAR. *grandifolia* Prain.

Neochawng, 2,500 ft. (E). This differs from the type very considerably and may be a distinct species, but the material is insufficient for definite decision. *Leaves* 6in. long, 2.25in. wide ; *pedicels* 2 in. long.

249. *Lysimachia ramosa* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Java. Previously collected by Dr. Griffith in the Hukung Valley, but not elsewhere in Burma. A distinct variety occurs in Ceylon.

#### LI.—MYRSINEÆ.

250. *Ardisia crenata* Sims.

Bansparao, 2,000 ft. (E). DISTRIB. China ; Japan ; Malaya ; also Pegu (*Kurz.*)

251. *Ardisia virens* Kurz.

Myitkyina (C). DISTRIB. Assam Ranges; also previously collected by Dr. J. Anderson at Munwine, in the Taping Valley.

252. *Pimelandra Griffithii* Clarke.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Previously collected by Dr. Griffith during his Hukung Valley journey.

## LII.—SAPOTACEÆ.

253. *Sarcosperma arboreum* Benth.

Myitkyina (C). DISTRIB. Himalaya; Assam; Hukung (*Griffith*); Pegu (*Brandis*).

[*Diospyros Kaki* Linn.—Near Kumpi Bum, the *Kég* fruit was brought to Lieutenant Pottinger's party by the villagers; the tree was not seen.]

## LIII.—STYRACEÆ.

254. *Symplocos racemosa* Roxb.

Myitkyina (C). DISTRIB. Northern India; Indo-China; China.

## LIV.—OLEACEÆ.

255. *Jasminum anastomosans* Wall.

Myitkyina (C). Banks of the 'Nmai Kha. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Burma.

256. *Jasminum decussatum* Wall.

Myitkyina (C). DISTRIB. Burma.

257. *Jasminum scandens* Vahl.

Namlao (E); Namlao to Bansparao, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo China.

## LV.—APOCYNEÆ.

258. *Rauwolfia chinensis* Hemsl.

Palā, 1,500 ft. (E). DISTRIB. China.

259. *Alstonia scholaris* R. Br.

Myitkyina (C). DISTRIB. Tropics of Old World.

260. *Tabernæmontana coronaria* R. Br.

Myitkyina (C). DISTRIB. Generally cultivated in South-Eastern Asia; native country unknown, probably not wild in the Kachin Hills.

261. *Holarrhena antidysenterica* Wall.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

262. *Vallisneria Heynei* Spreng.

Myitkyina (C). DISTRIB. India and Indo-China. Previously brought from the Taping Valley by Anderson.

263. *Pottsia cantoniensis* *Hook. & Arn.*

Palā, 1,500 ft. (E). DISTRIB. Assam; Burma; China; Malaya.

264. *Aganosma cymosum* *G. Don.*

Palā, 1,500 ft. (E). DISTRIB. Silhet; Cachar and Lushai Hills. The Kachin plant is exactly the same as the Silhet one, which constitutes *A. cymosum* proper.

#### LVI.—ASCLEPIADACEÆ.

265. *Periploca calophylla* *Falc.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; S. China.

This has not before been collected in Burma.

266. *Myriopteron paniculatum* *Griff.*

Myitkyina (C). DISTRIB. Assam, Burma; Malaya.

267. *Asclepias Curassavica* *Linn.*

Patzam, 3,100 ft. (E); Myitkyina (C). DISTRIB. Native of the West Indies, now a widespread weed in the Tropics.

268. *Cynanchum corymbosum* *Wight.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam; Burma; Malaya. Previously collected at Poneline in the Taping Valley.

269. *Pentasacme caudatum* *Wall.*

Namli, 2,000 ft. (E). DISTRIB. Assam Ranges and Burma, previously obtained by Dr. Griffith during his Hukung Valley journey.

270. *Hoya longifolia* *Wall.*

Neochawng, 2,500 ft. (E). DISTRIB. Himalaya and Assam Ranges; not before collected in Burma.

271. *Hoya parasitica* *Wall.*

Myitkyina (C). DISTRIB. Assam-Ranges; Burma; Andamans; Malaya.

272. *Ceropegia pubescens* *Wall.*

Myitkyina (C). DISTRIB. Himalaya and the Assam Ranges; not before sent from Burma.

#### LVII.—LOGANIACEÆ.

273. *Gelsemium elegans* *Bth.*

Myitkyina (E); (C). DISTRIB. Though omitted from the *Flora of British India*, this is very common in the mountain ranges between Assam and Burma; it was collected in the Hukung Valley by Griffith and at Poneshee in the Taping Valley by Anderson. It extends northwards into China and recurs in Sumatra.

274. *Buddleia asiatica* *Lour.*

Namlao (E). DISTRIB. India; Indo-China; China; Malaya.

# LVIII.—GENTIANACEÆ.

275. *Exacum teres* Wall.

Myitkyina (C). DISTRIB. Himalaya and the Assam Ranges; not previously collected in Burma.

276. *Exacum tetragonum* Roxb.

Myitkyina (C). DISTRIB. India; Himalaya; China. A distinct variety occurs in Lower Burma and Malaya; the Kachin plant is, however, the Himalo-Chinese and not the Malayan form.

# LIX.—BORAGINÆÆ.

277. *Cynoglossum micranthum* Desf.

Myitkyina (C). DISTRIB. Northern India and the Himalayas to Indo-China and China.

# LX.—CONVOLVULACEÆ.

278. *Ipomœa linifolia* DC.

Myitkyina (C). DISTRIB. Sikkim; Assam; Burma; Malaya; Australia.

279. *Ipomœa vitifolia* Sw.

Myitkyina (E); (C). DISTRIB. India; Indo-China; Malaya.

280. *Evolvulus alsinoides* Linn.

Myitkyina (C). DISTRIB. Throughout the Tropics.

281. *Porana paniculata* Roxb.

Namh, 2,000 to 2,500 ft. (E). DISTRIB. India; Indo-China, Malaya.

282. *Porana racemosa* Roxb.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China; China.

# LXI.—SOLANACEÆ.

283. *Solanum barbisetum* Nees, VAR. *Griffithii* Prain.

Myitkyina (C). DISTRIB. (of the variety), Upper Assam; also the Taping Valley and the Huking Valley. Though very different from the type, this hardly deserves to be considered a distinct species.

284. *Solanum biflorum* Lour.

Neochawng, 2,500 ft. (E); Myitkyina (C). DISTRIB. China; Indo-China; Malaya. Previously collected at Poneshee by Dr. J. Anderson.

285. *Solanum ferox* Linn., VAR. *inermis* Prain.

Myitkyina (C).

[*Physalis peruviana* Linn.—This was once seen in a garden during Lieutenant Pottinger's journey.]

286. *Nicotiana Tabacum* Linn.

Noichong to Phalé, 1,300 to 2,000 ft. (E). DISTRIB. Native of America ; cultivated in all warm countries. [Tobacco is very generally cultivated throughout the Kachin Hills ; only this species was met with by Lieutenant Pottinger's party ; *N. rotundifolia* appears to be unknown.]

## LXII.—SCROPHULARINEÆ.

287. *Torenia edentula* Griff.

Myitkyina (C). DISTRIB. Bihar ; Sikkim ; Assam ; Burma ; Malaya.

288. *Torenia flava* Ham.

Myitkyina (C). DISTRIB. Assam ; Burma ; China ; Malaya.

289. *Torenia rubens* Benth.

Chesyan, 3,000 ft. (E). DISTRIB. Sikkim ; Assam Ranges ; already collected by Dr. Griffith during the Hukung Valley journey. This is in reality exceedingly distinct from the next species, though the two are united in the *Flora of British India*.

290. *Torenia vagans* Roxb.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; China ; not before collected in Burma. The Nilgiri locality cited in the *Flora of British India* is erroneous.

291. *Vandellia scabra* Bth.

Myitkyina (C). DISTRIB. Throughout Tropics of Old World.

292. *Vandellia sessiliflora* Bth.

Myitkyina (C). DISTRIB. Bihar ; Himalaya ; Assam Ranges ; Burma.

293. *Bonnaya reptans* Spreng.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

294. *Bonnaya veronicæfolia* Bth.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

295. *Centranthera hispida* R. Br.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and in Australia.

## LXIII.—OROBANCHACEÆ.

296. *Æginetia indica* Linn.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

## LXIV.—LENTIBULARIÆ.

297. *Utricularia orbiculata* Wall.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

## LXV.—GESNERACEÆ.

298. *Æschynanthus grandiflora* Spreng., VAR. *longiflora* Prain.  
Myitkyina (C). Agrees with the type, except that the flowers are here 2·25 in. long.

299. *Æschynanthus levipes* C. B. Clarke.  
Lakham, 4,100 ft. (E). DISTRIB. Previously known only from the Mishmi Hills.

300. *Æschynanthus maculata* Lindl.  
Neochawng, 7,000 ft. (E). DISTRIB. Previously only known from the Eastern Himalaya.

301. *Æschynanthus micrantha* C. B. Clarke, VAR. *Pottingeri* Prain.

Namli, 2,000 ft. (E). DISTRIB. (of type) Sikkim. Capsules 10 in. long, otherwise extremely like the original examples, which are from Sikkim.

302. *Æschynanthus pusilla* Prain.

Myitkyina (C).

A very distinct species.

303. *Æschynanthus superba* C. B. Clarke.  
Myitkyina (C). DISTRIB. Assam Ranges ; never before collected in Burma.

304. *Rhynchotechum ellipticum* A. DC.

Myitkyina (C). DISTRIB. (of the type.) Malaya.

305. *Rhynchotechum ellipticum* A. DC., VAR. *angusta* Clarke.

Myitkyina (C). DISTRIB. (of the variety), Khasia, Karen Hills ; Martaban.

306. *Rhynchotechum vestitum* H. f. & T.

Mokong, 600 ft. (E). DISTRIB. Eastern Himalaya and Assam Ranges ; not before collected in Burma.

307. *Rhynchoglossum obliquum* DC., VAR. *parviflora* Clarke.

Myitkyina (C). DISTRIB. (of the variety.) India ; Himalaya ; Assam Ranges. The type occurs in Tenasserim and Malaya ; neither form had hitherto been collected in Upper Burma.

308. *Stauroanthera grandiflora* Bth.

Banks of the Tummao Kha, 700 ft. (E). DISTRIB. Indo-China and Malaya ; not before collected so far north.

309. *Didymocarpus elatior* Prain.

Myitkyina (C).

A rather striking species, most resembling *D. corchorifolia* from Malaya. It has the same woody stems, but is otherwise very distinct.

310. *Chirita pumila* Don.

Myitkyina (C). DISTRIB. Himalaya: Assam Ranges; not before collected in Burma.

311. *Chirita speciosa* Kurz.

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Taping Valley, where it was collected by Dr. J. Anderson, both at Poneshee and at Pone-line.

## LXVI.—BIGNONIA CEÆ.

312. *Mayodendron igneum* Kurz.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Assam Ranges; Indo-China; Taping Valley.

## LXVII.—PEDALINEÆ.

313. *Sesamum indicum* DC.

Banks of the Tummao Kha, 700 ft. (E). DISTRIB. Cultivated in all hot countries.

It is noted by Lieutenant Pottinger that oil-seed crops were conspicuously absent. The presence of this species in his collection and of *Perilla ocimoides* in that of the Calcutta Garden collector goes to show, however, that here and there patches of oil-seed crops do probably occur.

## LXVIII.—ACANTHACEÆ.

314. *Thunbergia coccinea* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Tenasserim; not before from Upper Burma.

315. *Thunbergia lutea* T. And.

Myitkyina (C). DISTRIB. Eastern Himalaya; not before reported from Burma.

316. *Thunbergia grandiflora* Roxb.

Myitkyina (C). DISTRIB. Eastern Bengal; Assam Ranges; collected also by Dr. J. Anderson in the Taping Valley and by a Calcutta Garden collector in the Bhamo District.

317. *Nelsonia campestris* R. Br.

Myitkyina (C). DISTRIB. Throughout the tropics.

318. *Hygrophila salicifolia* T. And., VAR. *assurgens* Clarke.

Myitkyina (C). DISTRIB. (of the variety), Eastern Bengal; Assam; Tenasserim and Malaya; not before sent from Upper Burma.

319. *Dædalacanthus tetragonus* T. And.

Namlao (E). DISTRIB. Burma; already collected in the Tapin Valley by Dr. J. Anderson.

320. *Strobilanthes capitatus* *T. And.*

Myitkyina (C) DISTRIB. Himalaya ; Assam Ranges ; Karen Hills.

321. *Strobilanthes coloratus* *T. And.*

Myitkyina (C) DISTRIB. Eastern Himalaya : Assam Ranges ; not before collected in Burma.

322. *Strobilanthes pentstemonoides* *T. And.*

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma. Our specimens agree well with examples named *S. pentstemonoides* by Kurz, from Pegu and from the Taping Valley, but less exactly with those from the Himalaya so named by Dr. T. Anderson himself.

[*Strobilanthes flaccidifolius* Nees.—Though this plant was never actually seen by Lieutenant Pottinger's party, it is fairly certain that it occurs throughout the Kachin Hills and is the source of the blue dye used by the people. Dr. Griffith met with it in the neighbouring Hukung Valley, and it is quite common in the mountains of Assam to the west, and in the Shan country to the south-east.]

The identifications of the two first species of *Strobilanthes* must be accepted as tentative only. In neither instance do the specimens agree absolutely with sheets of those species as named by Dr. Thos. Anderson himself, or with any other sheets named or unnamed in the Calcutta Herbarium, though in both cases we believe that the name suggested represents the species to which our plants bear respectively the closest affinity.

323. *Acanthus leucostachyus* *Wall.*

Myitkyina (E) ; Namli, 2,000 to 2,500 ft. (E). DISTRIB. Assam Ranges ; also common in the Taping Valley.

324. *Asystasia Neesiana* *Nees.*

Myitkyina (C). DISTRIB. Assam Ranges ; Indo-China.

325. *Eranthemum indicum* *Clarke.*

Myitkyina (C). DISTRIB. East Himalaya ; Assam Ranges ; Shan and Karen Hills.

326. *Eranthemum palatiferum*, *Nees.*

Namli, 2,000 ft. (E) ; 'Nsentaru, 600 ft. (E). DISTRIB. Eastern Himalaya ; Assam Ranges ; China ; previously collected in the Taping Valley by Dr. J. Anderson.

327. *Eranthemum palatiferum* *Nees.*, VAR. *elata* *Clarke.*

Myitkyina (C). DISTRIB. Burma.

328. *Codonacanthus pauciflorus* *Nees.*

Bansparao, 2,000 ft. (E). DISTRIB. Assam Ranges ; from Chittagong to Mishmi ; also in S. China ; but not before collected in Burma.

329. *Andrographis tenuiflora* *T. And.*

Myitkyina (C). DISTRIB. Assam Ranges ; Burma.

330. *Phlogacanthus curviflorus* *Nees*.  
Myitkyina (C). DISTRIB. Assam Ranges ; Burma.
331. *Phlogacanthus Jenkinsii* *Clarke*.  
Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Naga Hills  
(*Jenkins, Watt*) ; Bhamo (*J. Anderson*).
332. *Phlogacanthus pubinervius* *T. And.*  
Myitkyina (C). DISTRIB. Sikkim, Shan Hills.
333. *Phlogacanthus tubiflorus* *Nees*.  
Myitkyina (C). DISTRIB. Daphla Hills ; Assam Ranges ; not before  
sent from Burma.
334. *Lepidgathis hyalina* *Nees*.  
Myitkyina, 450 ft. (E). DISTRIB. India ; Indo-China ; China.
335. *Justicia procumbens* *Linn.*, VAR. *latispica* *Clarke*.  
Myitkyina (C). DISTRIB. India ; Indo-China ; China ; Malaya ; Aus-  
tralia.
336. *Adbatoda Vasica* *Nees*.  
Ningting, 3,000 ft. (E). DISTRIB. Throughout South-Eastern Asia.
337. *Rhinacanthus calcaratus* *Nees.*, VAR. *maxima* *Prain*.  
Myitkyina (C).  
Leaves faintly puberulous on both surfaces, panicle dense, corolla-  
tube 1.5 inch long ; capsule 2 inches long. Very possibly this should  
be considered a distinct species.
338. *Rungia stolonifera* *C.B. Clarke*.  
Lammuk, 2,500 ft. (E). DISTRIB. Hitherto only known from the  
Khasia Hills.
339. *Dicliptera Roxburghiana* *Nees*.  
Lammuk, 2,500 ft. (E). DISTRIB. India and Indo-China.

## LXIX.—VERBENACEÆ.

340. *Callicarpa arborea* *Roxb.*  
Myitkyina (E) ; (C). DISTRIB. Northern India and Himalaya ;  
Assam ; Indo-China ; Malaya.
341. *Caryopteris paniculata* *C.B. Clarke*.  
Myitkyina (E). DISTRIB. Eastern Himalaya and Assam Ranges ;  
also Taping Valley.  
[*Tectona grandis* *Linn.* fil.—The teak, though present at Myit-  
kyina, is not plentiful, and the trees are gnarled and stunted. It  
does not occur further north.]
342. *Premna herbacea* *Roxb.*  
Myitkyina (C). DISTRIB. India ; Himalaya ; Assam Ranges ; Burma.
343. *Premna milleflora* *C.B. Clarke*.  
Myitkyina (C). DISTRIB. Hitherto only known from Assam.

344. *Gmelina arborea Roxb.*

Phalé, 1,300 to 3,300 ft. (E). DISTRIB. South Eastern Asia, not extending into China.

345. *Vitex glabrata R. Br.*

Myitkyina (C). DISTRIB. Assam ; Indo-China ; Malaya ; North Australia.

346. *Clerodendron Colebrookeanum Wall.*

Myitkyina (C). DISTRIB. Eastern Himalaya, Assam Ranges, Indo-China, Malaya.

347. *Clerodendron Griffithianum C.B. Clarke.*

Namlao to Bansparao, 500 to 2,000 ft. (E); Myitkyina (C). DISTRIB. Hukung Valley, *Griffith* ; Taping Valley, *J. Anderson*.

348. *Clerodendron infortunatum Gaertn.*

Myitkyina (C) ; Bansparao, 2,000 feet (E). DISTRIB. India, Indo-China, Malaya.

349. *Clerodendron lasiocephalum C. B. Clarke.*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Assam Ranges from Jaintia to Mishmi ; also occurs among Dr. J. Anderson's specimens from the Taping Valley.

350. *Clerodendron nutans Wall.*

Namlao to Bansparao, 500 to 2,000 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya and Assam Ranges, also among Dr. J. Anderson's plants from the Taping Valley.

351. *Clerodendron serratum Spreng.*

Myitkyina (C). DISTRIB. India and Indo-China.

352. *Sphenodesma pentandrum Jack.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Assam Ranges ; China ; Indo-China ; Malaya.

353. *Congea tomentosa Roxb.*

Myitkyina, 450 ft. (E). DISTRIB. Chittagong ; Burma from Hukung Valley southwards ; Indo-China.

LXX.—LABIATÆ.

354. *Geniosporum strobiliferum Wall.*

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Shan Hills.

355. *Acrocephalus capitatus Bth.*

Myitkyina (C). DISTRIB. India ; Indo-China ; Malayan Archipelago.

356. *Orthosiphon stamineus Bth.*

Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.

357. *Plectranthus Coetsa H a. m.*

- Myitkyina (C). DISTRIB. Himalaya ; Assam ; Burma.  
 358. *Plectranthus hispidus* *Bth.*  
 Myitkyina (C). DISTRIB. Assam Ranges and Shan Plateau ; China.  
 359. *Plectranthus ternifolius* *Don.*  
 Myitkyina (C). DISTRIB. Bihar ; Himalaya ; Assam ; Burma and China.  
 360. *Dysophylla Auricularia* *DC.*  
 Myitkyina (C). DISTRIB. throughout South-Eastern Asia.  
 361. *Colebrookia oppositifolia* *Sm.*  
 Bansparao, 2,000 ft. (E) ; Myitkyina, 450 ft. (E). DISTRIB. India and Indo-China.  
 362. *Perilla ocimoides* *Linn.*  
 Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma ; China.  
 363. *Scutellaria glandulosa* *Hook. fil.*  
 Namli, 2,000 ft. (E). DISTRIB. Hukung Valley ; Shan Plateau ; Chin Hills.  
 364. *Achyropermum Wallichianum* *Bth.*  
 Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges , Burma.  
 365. *Notochæte hamosa* *Bth.*  
 Myitkyina (C). DISTRIB. Eastern Himalaya ; Naga Hills (*Prain*) ; never before sent from Burma.  
 366. *Leucas hyssopifolia* *Bth.*  
 Myitkyina (C). DISTRIB. Himalaya ; Burma ; not sent from Assam.  
 367. *Leucas mollissima* *Wall.*  
 Myitkyina (C). DISTRIB. India ; Indo-China : China.  
 368. *Gomphostemma lucidum* *Wall.*  
 Myitkyina (C). DISTRIB. Assam Ranges ; also previously collected in the Taping Valley by Anderson.  
 369. *Gomphostemma nutans* *Hook. fil.*  
 Myitkyina (C). DISTRIB. Khasia Hills and Chin Hills.  
 370. *Gomphostemma parviflorum* *Wall.* VAR. *farinosa* *Prain.*  
 Myitkyina (C). DISTRIB. Assam Ranges ; not before collected in Burma.  
 371. *Leucosceptrum canum* *Sm.*  
 Namli, 2,000 to 2,500 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; also previously collected by Dr. J. Anderson in the Taping Valley and by a Calcutta Garden collector in the Ruby Mines District of Upper Burma.  
 372. *Teucrium stoloniferum* *Roxb.*

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma ; China.

373. *Ajuga macrosperma* Wall. VAR. *breviflora* Hook. f.

Myitkyina (C). DISTRIB. Parasnath, Himalaya ; Assam Ranges ; not before collected in Burma though typical *A. macrosperma* has been. This is probably a good species ; if so considered, the name to be used for it is *Ajuga sikkimensis* Miq.

#### LXXI.—PLANTAGINEÆ.

374. *Plantago major* Linn.

Myitkyina (E). (C) ; DISTRIB. Cosmopolitan.

*Incompletæ.*

#### LXXII.—AMARANTACEÆ.

375. *Deeringia celosioides* Moq.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia ; also in Australia.

376. *Amarantus paniculatus* Linn.

Myitkyina (C). DISTRIB. Cultivated, or an escape ; in the Tropics of Old World.

377. *Aerua scandens* Wall.

Myitkyina (E). DISTRIB. Throughout Tropics of Old World.

378. *Gomphrena globosa* Linn.

Myitkyina (E). DISTRIB. Throughout the Tropics cultivated, or an escape ; probably originally American.

#### LXXIII.—POLYGONACEÆ.

379. *Polygonum alatum* Ham.

Myitkyina (C). DISTRIB. India ; Indo-China ; China ; Japan ; Abyssinia.

380. *Polygonum chinense* Linn.

Banks of the 'Nmai Kha, 900 ft. (E) ; Lammuk, 2,500 ft. (E) ;

Myitkyina (E) ; (C). DISTRIB. Throughout South-Eastern Asia.

381. *Polygonum runcinatum* Ham.

Myitkyina (C). DISTRIB. Himalaya ; Assam ; China ; Java ; not before collected in Burma.

382. *Polygonum viscosum*, Ham.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; China ; not before collected in Burma.

383. *Fagopyrum cymosum* Meissn.

Myitkyina, wild (C). DISTRIB. Himalaya; Assam Ranges; China; already also collected in Taping Valley. Perhaps this is no more than the next species in a wild state, the produce of seeds washed down from the higher Hills.

[*Fagopyrum esculentum* Moench.—Buckwheat is very generally cultivated throughout the Kachin Hills, especially in the higher villages.]

#### LXXIV.—PIPERACEÆ.

384. *Piper boëmeriæfolium* DC.

Myitkyina (C). DISTRIB. E. Himalaya; Assam Ranges; Burma.

385. *Piper Kingianum* Prain.

Myitkyina (C). DISTRIB. Taping Valley, where it was originally collected by Dr. J. Anderson.

A very distinct species.

#### LXXV.—CHLORANTHACEÆ.

386. *Chloranthus brachystachyus* Meissn.

Neuchawng, 7,000 ft (E). Myitkyina (C). DISTRIB. Throughout South-Eastern Asia, but apparently absent from the Himalayan Ranges west of the Daphla Hills.

#### LXXVI.—LAURINEÆ.

387. *Phœbe attenuata* Nees.

Namlao to Bansparao, 500 to 2,000 ft. (E); Namli, 2,000 to 2,500 ft. (E); near Myitkyina, 5,000 ft. (E). DISTRIB. Eastern Himalaya, Assam Ranges; not before collected in Burma.

388. *Phœbe paniculata* Nees.

Myitkyina (C). DISTRIB. India; Indo-China; not in Himalaya or in Assam.

389. *Actinodaphne sikkimensis* Meissn.

Myitkyina (C). DISTRIB. E. Himalaya, Manipur; not before sent from Burma.

390. *Litsæa polyantha* Fuss.

Kepio, 2,900 ft. (E). DISTRIB. India; Himalaya; Indo-China; China; Malaya.

391. *Litsæa salicifolia* Roxb. VAR. *ellipsoidea* Meissn.

Namli, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; not before sent from Burma.

392. *Litsæa sebifera* Pers.

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and in Australia.

393. *Lindera assamica Kurz.*

Neochawng, 2,500 ft. (E). DISTRIB. Assam Ranges ; also previously collected at Poneline in the Taping Valley.

LXXVII.—THYMELEÆ.

394. *Wikstroemia canescens Meissn.*

Myitkyina (C). DISTRIB. Ceylon ; Himalaya ; Assam ; Shan Hills ; (*King's Collectors*) ; China.

395. *Daphne pendula Sm.*

Myitkyina (C). DISTRIB. Karen Hills ; Pegu ; Malay Islands not before met with so far north.

LXXVIII.—LORANTHACEÆ.

396. *Loranthus involucratus Roxb.*

Myitkyina (E). DISTRIB. Himalaya : Assam Ranges ; from Chittagong northwards.

397. *Loranthus pentapetalus Roxb.*

Myitkyina (C) ; Palá, 1,500 ft (E). DISTRIB. Himalaya ; Assam Ranges ; China ; Indo-China ; Malaya.

LXXIX.—EUPHORBIACEÆ.

398. *Bridelia pubescens Kurz.*, VAR. *glabra Prain.*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Taping Valley.

Previously obtained at Poneshee by Dr. J. Anderson ; it has precisely the fruits of *B. pubescens*, with leaves of the same size and shape and with similar venation. It differs in having the leaves glaucous and quite glabrous beneath.

399. *Sauropus albicans DC.*

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

400. *Glochidion assamicum Hook. fil.*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; from Chittagong northwards ; also previously collected by Griffith in the Hukung Valley.

401. *Glochidion villicaule Hook. fil.*

Myitkyina (C). DISTRIB. Hukung Valley (*Griffith*) ; Taping Valley (*Anderson*) ; Malay Peninsula.

402. *Fluggea microcarpa DC.*

Myitkyina (C). DISTRIB. Warmer parts of Eastern Hemisphere.

403. *Aporosa oblonga Muell.-Arg.*

Myitkyina (C). DISTRIB. Assam Ranges ; Burma.

404. *Aporosa Roxburghii Muell.-Arg.*

Ningting, 3,000 ft. (E). DISTRIB. Eastern Himalaya ; Assam Ranges ; Burma.

405. *Daphniphyllum himalayense* *Muell.-Arg.*

Himalaya ; Assam Ranges.

406. *Antidesma Ghæsembhilla* *Gaertn.*

Myitkyina (C). DISTRIB. Tropics of Old World.

407. *Croton oblongifolius* *Roxb.*

Namli, 2,000 ft. (E). DISTRIB. India ; Assam ; Burma ; not in the Himalaya proper.

408. *Acalypha* ? sp.

Lammuk, 2,500 ft. (E).

Very distinct from anything in the Calcutta Herbarium, but too incomplete for description.

409. *Mallotus alba* *Muell.-Arg.*

Mokong, 600 ft. (E). DISTRIB. E. Himalaya ; and Assam Ranges ; from Chittagong northwards ; never before reported from Burma.

410. *Mallotus nepalensis* *Muell.-Arg.*

Neochawng, 1,000 ft. (E). DISTRIB. E. Himalaya and Assam Ranges ; from Chittagong northwards ; never before reported from Burma.

411. *Macaranga denticulata* *Muell.-Arg.*

Neochawng, 7,000 ft. (E). DISTRIB. Himalaya ; Assam ; Indo-China ; Malaya.

412. *Homonoia riparia* *Lour.*

Myitkyina (C). DISTRIB. India, Indo-China ; Malaya ; China.

413. *Baliospermum micranthum* *Muell.-Arg.*

Myitkyina (C). DISTRIB. Khasia Hills ; Chin Hills (*Calcutta Garden Collectors*).

414. *Ricinus communis* *Linn.*

Myitkyina (E). DISTRIB. Generally cultivated in the tropics ; probably a native of Africa.

This was also seen at various villages, but always near the frontier ; the seeds are used for their oil, but the oil is not employed medicinally.

415. *Gelonium multiflorum* *A. Fuss.*

Myitkyina (C). DISTRIB. Throughout South-Eastern Asia.

#### LXXX.—URTICACEÆ.

416. *Gironniera reticulata* *Thwaites.*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. India ; Indo-China ; Java.

417. *Cannabis sativa* *Linn.*

*Maté*, 1,500 (E)., apparently wild. DISTRIB. Cultivated, or an escape in temperate and tropical regions.

The uses of this plant appeared to Lieutenant Pottinger to be unknown to the Kachins.

418. *Streblus asper* *Lour.*

Myitkyina (E). (C). Banks of the 'Nmai Kha, 900 ft. (E). DISTRIB. Throughout South-Eastern Asia in the drier parts.

[*Morus indica* Linn.—This was plentiful near Galing Village in the Upper Valley of the Nachawng Kha; no specimens were brought away.]

419. *Ficus clavata* *Roxb.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China, Malaya.

420. *Ficus clavata* *Roxb.*, VAR. *trachycarpa* *Wall.* (sp.).

Myitkyina (C). DISTRIB. Assam Ranges.

[*Ficus elastica* *Roxb.*—Met with, but by no means plentifully, south of the Tumpang Kha.]

421. *Ficus hirta* *Vahl.*

Myitkyina (C); Shigu Ferry, 800 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China; China; Malaya.

422. *Ficus hirta* *Vahl.*, VAR. *Roxburghii* *King.*

Nawgo Kha, 1,300 to 2,000 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Indo-China; China; Malaya.

423. *Ficus mysorensis* *Heyne.*, VAR. *subrepanda* *King*

Myitkyina (C). DISTRIB. (of the variety), Himalaya; Assam Ranges; Burma.

424. *Ficus obscura* *DC.*

Myitkyina, 450 ft. (E); Lammuk, 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; Burma; Malaya.

425. *Ficus obtusifolia* *Roxb.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam; Indo-China; Malaya.

426. *Cudrania fruticosa* *Trec.*

Myitkyina (C). DISTRIB. Assam Ranges; Burma.

427. *Conocephalus suaveolens* *DC.*

Namli, 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges, Burma and Malaya.

428. *Pilea bracteosa* *Wedd.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; not previously reported from Burma.

429. *Boehmeria macrophylla* *Don.*

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Himalaya; Assam Ranges;

also previously collected by Dr. J. Anderson in the Taping Valley.

430. *Boehmeria platyphylla* Don.

Myitkyina (E) ; Namlao (E). DISTRIB. Tropics of Old World.

431. *Boehmeria platyphylla* Don. VAR. *scabrella* Wedd.

Myitkyina (C). DISTRIB. India ; Himalaya ; Assam ; not before collected in Burma.

432. *Elatostema papillosum* Wedd.

Ncochawng, 2,500 ft. (E). DISTRIB. Assam Ranges ; not before collected in Burma.

433. *Elatostema platyphyllum* Wedd.

Namli, 2,000 to 2,500 ft. (E). DISTRIB. Eastern Himalaya ; Assam Ranges ; not before collected in Burma.

434. *Elatostema rupestre* Wedd.

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; Burma ; Malay Islands.

435. *Maoutia Puya* Wedd.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma ; Sumatra.

#### LXXXI.—JUGLANDEÆ.

[*Juglans regia* Linn.—The walnut is cultivated by the Chinese along the Kachin frontier.]

[*Juglans* sp.—A walnut that differs markedly from the ordinary tree in having a very hard shell, which it is almost impossible to break, is planted in many of the villages throughout the Kachin Hills. It seemed in other respects to be only a form of the preceding. Lieutenant Pottinger's party did not bring any specimens.]

436. *Engelhardtia spicata* DC.

Myitkyina (E). DISTRIB. Himalaya ; Assam Ranges ; Indo-China ; Malaya.

#### LXXXII.—CUPULIFERÆ.

437. *Castanopsis tribuloides* A. DC.

Myitkyina (C). DISTRIB. Himalaya, Assam Ranges ; Burma.

438. *Alnus nepalensis* Wall.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges. Already sent, from the Taping Valley and from the Kachin and Chin Hills, but not from elsewhere in Burma.

439. *Betula alnoides* Ham.

Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; Burma.

[Several Oaks and Chestnuts were seen by Lieutenant Pottinger's party, but no specimens could be brought. One chestnut in particular

planted near villages on the Chinese frontier, did not seem to differ in any way from the familiar European tree.]

### LXXXIII.—SALICINÆ.

440. *Salix tetrasperma* Roxb.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

### LXXXIV.—GNETACEÆ.

441. *Gnetum Gnemon* Linn.

Namlao to Bansparao, 500 to 2,000 ft. (E); Patzam, 1,100 ft. (E); Myitkyina (C). DISTRIB. Assam Ranges; Malaya; not before collected in Burma.

### CONIFERÆ.

[Two conifers were met with, as described in the Introduction, on the high ranges near the head-waters of the Lakhing Kha and Nawachang Kha. One of these was a Pine, most probably *Pinus Khasya*; the other a fir, the genus to which it belongs being uncertain. As Lieutenant Pottinger has already explained, the party were unable to collect or bring away specimens during the part of the journey that lay over these ranges.]

### MONOCOTYLEDONES.

### LXXXV.—ORCHIDACEÆ.

442. *Microstylis biaurita* Lindl.

Myitkyina (C). DISTRIB. Previously only known from the Khasia Hills.

443. *Oberonia iridifolia* Lindl.

'Nsentalu, 600 ft. (E). DISTRIB. India; Indo-China.

444. *Oberonia* sp.

Neochawng, 7,000 ft. (E).

In fruit only, and not identifiable; perhaps nearest *O. Falconeri*.

445. *Liparis longipes* Lindl.

Lammuk, 2,500 ft. (E); Chesyan, 3,000 ft. (E); Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya.

446. *Dendrobium cariniferum* Roxb.

Myitkyina (E). DISTRIB. Naga Hills; Manipur; Shan Hills; from Bhamo southwards.

447. *Dendrobium chrysanthum* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Shan Plateau.

448. *Dendrobium cretaceum* *Lindl.*  
Myitkyina (E). DISTRIB. Western Himalaya ; Assam Ranges ;  
Burma ; Andamans.
449. *Dendrobium Falconeri* *Hook.*  
Myaungjong, 1,000 ft. (E). DISTRIB. Bhootan ; Assam Ranges ;  
Upper Burma.
450. *Dendrobium lituiflorum* *Lindl.*  
'Nsentaru, 600 ft. (E). DISTRIB. Assam Ranges ; Burma.
451. *Dendrobium nobile* *Lindl.*  
Lammuk, 2,500 ft. (E). DISTRIB. Eastern Himalaya ; Assam  
Ranges ; China ; not previously collected in Burma.
452. *Dendrobium Pierardi* *Roxb.*  
Ningting, 900 ft. (E) · DISTRIB. Eastern Himalaya ; Assam ; Burma.
453. *Dendrobium transparens* *Wall.*  
Namli, 2,000 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; not  
before sent from Burma.
454. *Dendrobium Wardianum* *Warner.*  
Myitkyina (E). DISTRIB. Assam Ranges, Burma.
455. *Dendrobium papilliferum* *King & Pantling.*  
Myitkyina (C).
456. *Bulbophyllum Careyanum* *Spreng.*  
Myitkyina (E) ; (C). DISTRIB. Eastern Himalaya ; Assam Ranges ;  
Burma.
457. *Bulbophyllum leopardinum* *Lindl.*  
Mate, 1,500 ft. (E) ; Myaungjong, 800 ft. (E). DISTRIB. Eastern  
Himalaya ; Assam Ranges ; not before sent from Burma.
458. *Bulbophyllum reptans* *Lindl.*  
Neochawng, 7,000ft. (E). DISTRIB. Eastern Himalaya ; Assam  
Ranges ; not before collected in Burma.
459. *Bulbophyllum suavissimum* *Rolfe.*  
Myitkyina (E). DISTRIB. Upper Burma.
460. *Bulbophyllum fimbrilligerum* *King & Pantling.*  
Myitkyina (C.)
461. *Ione kachinensis* *King & Pantling.*  
Myitkyina (C).
462. *Cirrhopetalum maculosum* *Lindl.*  
Lammuk, 2,500 ft. (E) DISTRIB. Himalaya ; Khasi Hills ; not  
before collected in Burma.
463. *Cirrhopetalum refractum* *Zoll.*  
Myitkyina (E). DISTRIB. Himalaya ; Tenasserim ; Java.
464. *Eria clavicaulis* *Wall.*  
Myitkyina (C). DISTRIB. Khasia ; not before sent from Burma.

465. *Eria paniculata* *Lindl.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; not before collected in Burma.

466. *Eria pannea* *Lindl.*

Lammuk, 2,400 ft. (E); Hankow, 500 ft. (E); Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Tenasserim; Malaya; not previously obtained so far north.

467. *Eria stricta* *Lindl.*

Myitkyina (E). DISTRIB. Himalaya; Assam Ranges; also in Siam but not before collected in Burma.

468. *Pachystoma senile* *Reichb. fil.*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; S. China.

469. *Spathoglottis pubescens* *Lindl.*

Myitkyina (C). DISTRIB. Assam Ranges; Indo-China; China.

470. *Phajus albus* *Lindl.*

Myitkyina (C). DISTRIB. India; Himalaya; Indo-China.

471. *Nephelaphyllum* sp.

Bansparao, 2,000 ft. (E.)

A handsome plant with beautifully mottled leaves, nearest to *N. pulchrum* Benth. but evidently distinct. Unfortunately there are no flowers and it cannot be described.

472. *Tainia viridifusca* *Benth.*

Myitkyina (E). DISTRIB. Assam, Burma.

473. *Anthogonium gracile* *Lindl.*

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China.

474. *Agrostophyllum khasianum* *Griff.*

'Nsentaru, 600 ft. (E). DISTRIB. Assam Ranges, Burma, Andamans; also recently found in Sikkim.

475. *Cœlogyne Gardneriana* *Lindl.*

Lakham, 4,100 ft. (E). DISTRIB. Himalaya; Assam Ranges; Karen Hills; not previously found so far north.

476. *Cœlogyne graminifolia* *Par. & Rchb. f.*

Namli, 2,000 ft (E). DISTRIB. Assam Ranges; Tenasserim; not before found so far north.

477. *Cœlogyne* sp.

Neochawng, 7,000 ft. (E). Nearest *C. ochracea*, but quite distinct from any species in the Herbarium at Calcutta, though the material hardly permits of description.

478. *Otochilus fusca* *Lindl.*

Neochawng, 7,000 ft. (E); Myitkyina (E). DISTRIB. Himalaya; Assam Ranges; not before collected in Burma.

479. *Pholidota imbricata* *Lindl.*

Patzam, 1,100 ft. (E); Namlao (E). DISTRIB. India; Himalaya; Assam; Burma; Andamans.

480. *Pholidota rubra* Lindl.

Lakham, 4,100 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; also previously collected by Griffith during his Hukung Valley journey.

481. *Calanthe angusta* Lindl.

Myitkyina (C). DISTRIB. Assam Ranges; not previously reported from Burma.

482. *Calanthe brevicornu* Lindl.

Mountain ranges near head-waters of Nachawng Kha Valley (E). DISTRIB. Himalaya: another distinct form has been collected by Dr. Watt in Manipur. Our plant differs somewhat in coloration from the type. The following is Lieutenant Pottinger's field-note: "Small upright-growing plant, leaves plaited, 10 in. long, 3 in. broad, pseudo-bulb fleshy, light green, about 1½ in. long. Flower-spike erect, 18 in. long, with 14 to 20 single flowers, petals rather smaller and narrower than sepals, both being pale green; lip white touched with rose in front and at the sides; three yellow ridges in the throat; each flower measuring 1¾ in. across, with scent much like that of gorse."

483. *Calanthe densiflora*, Lindl.

Lammuk (E). DISTRIB. Eastern Himalaya; Assam Ranges; not before reported from Burma.

484. *Arundina bambusifolia* Lindl.

Shigu Ferry, 800 ft. (E); Myitkyina (C). DISTRIB. India; Himalaya; Indo-China; Java. The Myitkyina specimens are typical, those from Shigu Ferry are *in externals* very like the *A. minor* of Ceylon.

485. *Eulophia nuda* Lindl.

Myitkyina (C). DISTRIB. India; Himalaya; Assam Ranges; Burma.

486. *Eulophia longibracteata* King & Pantling.

Myitkyina (C).

487. *Cymbidium eburneum* Lindl. VAR.

Lakham, 4,100 ft. (E). DISTRIB. (of type), Eastern Himalaya and Assam Ranges.

Lieutenant Pottinger, to whom the typical *C. eburneum* of the Khasia Hills is quite familiar, notes that while this is no doubt referable to the species, it is certainly not the same as the typical variety. It may possibly be the VAR. *Parishii* of the *Flora of British India*,

but the material is insufficient for absolute determination; VAR. *Parishii* is a native of the Karen Hills.

488. *Geodorum dilatatum*, R. Br.

Myitkyina (C). DISTRIB. India and Indo-China.

489. *Rhyncostylis retusa* DC.

Myitkyina (C) DISTRIB. India; Indo-China; Malaya.

490. *Sarcochilus* sp.

Myitkyina (C).

491. *Aerides Fieldingii* Lodd.

Myaungjong, 800 ft. (E); Kepio, 2,900 ft. (E). DISTRIB. Eastern Himalaya and Assam; not before reported from Burma.

492. *Aerides multiflorum* Roxb.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges and Tenasserim; not previously reported from Upper Burma.

493. *Vanda Bensoni* Batem.

'Nsentaru, 3,000 to 3,200 ft. (E). DISTRIB. Indo-China.

494. *Vanda teres* Lindl.

Myitkyina (C). DISTRIB. Base of Eastern Himalaya; Assam; Burma; Andamans.

495. *Saccolabium gemmatum* Lindl.

Lammuk, 2,500 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; not before sent from Burma.

496. *Saccolabium papillosum* Lindl.

Namli, 2,000 ft. (E). DISTRIB. The Circars; Himalayas; Assam and Burma.

497. *Saccolabium obliquum* Lindl?

Myitkyina (C). DISTRIB. Burma? Our example is in fruit only and cannot be absolutely determined.

498. *Saccolabium Cruddasianum* King & Pantling.

Myitkyina (C).

499. *Sarcanthus filiformis* Lindl.

Pungwa Tungs, 3,100 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Burma.

500. *Sarcanthus pallidus* Lindl.

Palá, 1,500 ft. (E); Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Burma.

501. *Ornithochilus fuscus* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; China.

502. *Vanilla* sp.

Myitkyina (E). DISTRIB. Chittagong.

In foliage nearest to *V. Moonii* but apparently ; quite distinct. The same plant occurs in the Herbarium at Calcutta, from Chittagong ; unfortunately neither example suffices for descriptive purposes.

503. *Tropidia curculigoides* *Lindl.*

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Burma ; Malaya ?

504. *Goodyera procera* *Hook.*

Kepio, 2,900 ft. (E) ; Myitkyina (E). DISTRIB. India ; Indo-China ; China ; Malaya.

505. *Pogonia carinata* *Lindl.*

Myitkyina (C). DISTRIB. Throughout peninsular India and in the plains of Burma ; absent from the Himalaya.

506. *Pogonia Juliana* *Wall.*

Myitkyina (C). DISTRIB. Plains of India and Assam ; not before reported from Burma.

507. *Epipogum nutans* *Rehb. fil.*

Myitkyina (C). DISTRIB. India ; Himalaya : Assam ; Malaya ; not before sent from Burma. Also found in Africa and Australia.

508. *Habenaria constricta* *Hook.*

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges and Tenasserim ; not before sent from Upper Burma.

509. *Habenaria Cruddasiana* *Prain.*

Myitkyina (C).

A distinct species ; very nearly related to *H. reniformis* from the Assam Ranges.

510. *Habenaria Galeandra* *Benth.*

Myitkyina (C). DISTRIB. India ; Himalaya ; Burma ; China.

511. *Habenaria geniculata* *Don.*

Myitkyina (C). DISTRIB. Himalaya, Assam Ranges ; Burma.

512. *Habenaria Helferi* *Hook. fil.*

Myitkyina (C). DISTRIB. Assam Ranges, Burma.

513. *Habenaria furfuracea* *Hook. fil.*

Myitkyina (C). DISTRIB. Khasia Hills ; not before collected in Burma.

514. *Habenaria Parishii*, *Hook. fil.*

Myitkyina (C). DISTRIB. Eastern Himalaya ; Andamans ; Burma.

515. *Habenaria Susannæ* *R. Br.*

Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya ; China.

516. *Habenaria Pottingeriana* *King & Pantling.*

Myitkyina (C).

Near *H. aristata*, but the lateral lip-segments very much longer.

517. *Habenaria trichosantha* *Wall.*

Myitkyina (C). DISTRIB. Burma; previously collected by Anderson in the Taping Valley.

518. *Apostasia Wallichii* Br.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; Indo-China; Malaya; New Guinea; Ceylon.

# LXXVI.—SCITAMINEÆ.

519. *Globba multiflora* Wall.

Myitkyina (E); (C). DISTRIB. Eastern Himalaya; Assam Ranges; not before sent from Burma.

520. *Globba sessiliflora*, Wall.

Myitkyina (E). DISTRIB. Burma.

521. *Hemiorchis Pantlingii* King.

Noichong to Phalé, 1,300 to 2,000 ft. (E). DISTRIB. Eastern Himalaya; Assam Ranges; nearly allied to, but quite different from, *H. burmannica* Kurz of Pegu.

522. *Curcuma aromatica* Salisb.

Myitkyina (March 1897) (E). DISTRIB. India; Indo-China.

523. *Curcuma plicata* Wall.

Myitkyina (June 1897.) (C). DISTRIB. Burma.

524. *Curcuma Roscoeana* Wall.

Myitkyina (C). DISTRIB. Burma.

525. *Gastrochilus longiflora* Wall.

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Burma; Malaya.

526. *Gastrochilus pulcherrima* Wall.

Myitkyina (C). DISTRIB. Burma; Malaya.

527. *Kæmpferia marginata* Wall.

Myitkyina (C). DISTRIB. Indo-China; Malaya.

528. *Kæmpferia rotunda* Linn.

Myitkyina (C). DISTRIB. India; Himalaya; Indo-China; Malaya.

529. *Hedychium coccineum* Ham.

Myitkyina (C) DISTRIB. Himalaya; Assam Ranges; previously collected in the Taping Valley but not elsewhere in Burma.

530. *Hedychium coronarium* Kænig.

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

531. *Hedychium luteum* Herb. Calcutta.

Myitkyina (C). DISTRIB. Assam; not before sent from Burma.

532. *Zingiber capitatum* Roxb., VAR. *elata* Bak.

Myitkyina (C). DISTRIB. Himalaya; Assam Ranges; not before sent from Burma.

533. *Zingiber chrysanthum Roscoe.*

Myitkyina (C). DISTRIB. Eastern Himalaya from Sikkim to Daphla Hills; not before sent from Burma.

534. *Zingiber Zerumbet Sm.*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya; China.

535. *Alpinia Galanga Sm.*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

#### LXXXVII—HÆMODARCEÆ.

536. *Ophiopogon cordylinoides Prain.*

Namli, 2,000 ft. (E); Myitkyina (E), (C).

537. *Ophiopogon Wallichianus Hook. f.*

Neochawng, 7,000 ft. (E). DISTRIB. Himalaya; Assam Ranges; Shan Plateau and Karen Hills. Previously collected in the Taping Valley.

#### LXXXVIII—AMARYLLIDACEÆ.

538. *Hypoxis aurea Lour.*

Myitkyina (C). DISTRIB. India; Indo-China; China; Malaya.

#### LXXXIX—TACCACEÆ.

539. *Tacca laevis Roxb.*

Myitkyina (C). DISTRIB. India; Indo-China; Malaya.

#### XC—DIOSCOREACEÆ.

540. *Dioscorea oppositifolia Linn.*

Namlao (E); Myitkyina (C); DISTRIB. India; Himalaya; Assam Ranges; not before sent from Burma.

541. *Dioscorea Dæmona Roxb.*

Myitkyina (C). DISTRIB. General in forests of South-East Asia.

#### XCI—LILIACEÆ.

542. *Smilax ferox Wall.*

Lammuk, 2,500 ft. (E). DISTRIB. Himalaya; Assam Ranges; Indo-China.

543. *Smilax lanceæfolia Roxb.*

Namlao to Bansparao, 500 to 2,000 ft. (E); Palá, 500 ft. (E). Chipwi Kha, 1,000 ft. (E). DISTRIB. Himalaya; Assam Ranges; Indo-China; China.

544. *Smilax Roxburghiana Wall.*

Myitkyina (C). DISTRIB. Bihar; Himalaya; Assam Ranges; not before sent from Burma.

545. *Smilax macrophylla* Roxb.

Myaungjong (E). DISTRIB. India ; Indo-China.

546. *Tupistra aurantiaca* Wall.

Palá, 1,500 ft. (E). DISTRIB. Eastern Himalaya ; Assam Ranges ; not before sent from Burma.

547. *Dracæna ensifolia* Wall.

Namlao to Bansparao, 500 ft. to 2,000 ft. (E) ; Namli, 2,000 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; Indo-China.

This species is sometimes united with *D. angustifolia* Roxb ; the two are however remarkably distinct. The present plant is an under-shrub common at from 2,000 to 4,500 feet throughout the Eastern Himalaya and in the mountains of Indo-China. Roxburgh's *D. angustifolia* is a purely littoral Malayan tree.

548. *Dracæna spicata* Roxb.

Myitkyina (E) ; Namlao to Bansparao, 500 to 2,000 ft (E) ; Lammuk, 2,400 ft. (E). DISTRIB. Assam Ranges, Chittagong and Andamans ; not before sent from Burma.

549. *Polygonatum cirrhifolium* Royle.

Myitkyina (C). DISTRIB. Throughout Northern Asia.

550. *Polygonatum nervulosum* Bak.

Myitkyina (C). DISTRIB. Sikkim ; Bootan and Daphla ; not before sent from Burma.

551. *Disporum pullum* Salisb., VAR. *oblanceolatum* Prain.

Lammuk, 2,400 ft. (E).

A very distinct variety ; the flowers not yet reported.

552. *Paris polyphylla* Don.

Nawgo Kha, 1,300 to 2,000 ft. (E) ; Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; W. China ; Burma.

[ A Garlic which the Chinese interpreter, and following his example, the other members of Lieutenant Pottinger's party were glad to use as a vegetable during the marches subsequent to the attack that was made on them ; occurs in considerable quantity on the high mountain ranges at the head waters of the Lakhing Kha. ]

## XCII.—PONTEDERIACEÆ.

553. *Monochoria vaginalis* Presl.

Myitkyina (C). DISTRIB. Throughout the Tropics of the Eastern Hemisphere.

## XCIII.—COMMELINACEÆ.

554. *Polia Aclisia* Hassk.

Myitkyina (C). DISTRIB. Eastern Himalaya ; Assam Ranges ; Indo-China ; Malaya.

555. *Commelina bengalensis* Linn.  
Myitkyina (C). DISTRIB. Tropics of Old World.
556. *Commelina obliqua* Don.  
Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.
557. *Commelina salicifolia* Roxb.  
Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya ; China ;  
not in the Himalayas.
558. *Aneilema lineolatum* Kunth.  
Myitkyina (C), DISTRIB. India ; Indo-China ; Malaya.
559. *Aneilema scaberrimum* Kunth.  
Myitkyina (C). DISTRIB. India ; Indo-China ; Malaya.
560. *Aneilema triquetrum* Wall.  
Myitkyina (C). DISTRIB. Assam Ranges ; China ; not before  
collected in Burma.
561. *Streptolirion volubile* Edgew.  
Myitkyina (C). DISTRIB. Himalaya ; Assam Ranges ; China ; also  
previously collected by Griffith during his Hukung Valley journey.
562. *Streptolirion volubile* Edgew. VAR. *setosa* Prain.  
Myitkyina (C).  
An extremely distinct variety.
563. *Floscopa scandens* Lour.  
Myitkyina (C). DISTRIB. Throughout South-Eastern Asia and  
in Australia.

## XCIV.—PALMEÆ.

564. *Pinanga gracilis* Bl.  
Patzam, 1,100 ft. (C). DISTRIB. Eastern Himalaya ; Assam  
Ranges ; Burma.
565. *Wallichia disticha* T. And.  
Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Himalaya, Burma.  
[*Caryota obtusa* Griff.?—The "Seit" described in the intro-  
ductory chapter is a *Caryota* and apparently is this species ; at all  
events Lieutenant Pottinger does not recognise it either in *C. urens*  
or in *C. mitis* ; though very like the former of these two, it has  
somewhat different leaves. No examples were brought. The original  
locality for *C. obtusa* is the not far distant Mishmi country.]
566. *Phoenix humilis* Roxb., VAR. *Loureirii* Becc.  
Myitkyina (E). DISTRIB. Assam Ranges and Indo-China.
567. *Plectocomia assamica* Griff.  
Bansparao, 2,000 ft. (E). DISTRIB. Assam  
This species is very common in the lower hills.  
[The canes for bridges on the rivers are obtained locally from  
one or more species of *Calamus*, of which no specimens were brought.]

XCV.—AROIDEÆ.

568. *Arisæma album* *N. E. Br.*

Myitkyina (C). DISTRIB. Khasia Hills; not before sent from Burma.

569. *Arisæma concinnum* *Schott.*

Myitkyina (C). DISTRIB. Eastern Himalaya; not before sent from Burma.

570. *Arisæma petiolulatum* *Hook.f.*

Myitkyina (C). DISTRIB. Khasia Hills and Manipur; not before sent from Burma.

571. *Typhonium cuspidatum* *Bl.*

Myitkyina (C). DISTRIB. Lower Bengal; Burma; Malaya.

572. *Typhonium gracile* *Schott.*

Myitkyina (C). DISTRIB. Assam; Silhet; also in the Punjab.

573. *Typhonium inopinatum* *Prain.*

Myitkyina (C). DISTRIB. Bengal (doubtfully wild).

574. *Typhonium Pottingeri* *Prain.*

Myitkyina (C).

Raised from tubers sent from Myitkyina and grown in the Calcutta Botanic Garden.

575. *Amorphophallus Cruddasianus* *Prain.*

Noichong to Phalé, 1,300 to 2,000 ft. (E); Myitkyina (C).

Very distinct because of its long parsnip-like corms, of which examples are under cultivation in the Calcutta Garden.

576. *Amorphophallus* sp.

Myitkyina (C).

Also being cultivated in the Calcutta Garden; as yet only leaves have been produced, so that the species cannot be determined.

577. *Gonatanthus sarmentosus* *Klotzsch.*

Myitkyina (C); Namlao (E). DISTRIB. East Himalaya; Assam Ranges; not before collected in Burma.

578. *Colocasia antiquorum* *Schott.*

Myitkyina (C). DISTRIB. Cultivated in all warm countries.

This was very generally found by Lieutenant Pottinger's party in the neighbourhood of villages throughout the Kachin Hills.

579. *Alocasia indica* *Schott.*

Namlao (E), Myitkyina (C). DISTRIB. Cultivated in all hot countries. Almost as common as the preceding.

580. *Steudnera capitellata* *Hook.*

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Burma. Previously collected by Dr. J. Anderson in the Taping Valley.

581. *Lasia aculeata* *Lour.*

Namlao (E); Bansparao, 2,000 ft. (E). DISTRIB. India; Indo-China; China; Malaya.

582. *Pothos Cathcartii* *Schott.*

Shigu Ferry, 800 ft. (E); Palá, 1,500 ft. (E). DISTRIB. Himalaya; Assam Ranges, Burma.

583. *Pothos scandens* *Linn.*

Bansparao, 2,000 ft. (E). DISTRIB. India; Indo-China; Malaya; China.

584. *Pothos Vriesianus* *Schott.*

Namlao to Bansparao, 500 ft. to 2,000 ft. (E). DISTRIB. East Himalaya, Assam; not before sent from Burma.

[ Besides the foregoing a *Raphidophora* was collected during the expedition, but the specimens were among the articles abandoned when the party was attacked. ]

XCVI.—ALISMACEÆ.

585. *Sagittaria sagittifolia* *Linn.*

Myitkyina (C). DISTRIB. Plains of Northern India, North Europe, Asia and America.

XCVII.—NAIADACEÆ.

586. *Aponogeton crispus* *Thunbg.*

Myitkyina (C). DISTRIB. India; Indo-China; Australia.

587. *Potamogeton perpusillus* *Linn.*

Myitkyina (C). DISTRIB. Temperate and sub-tropical regions.

XCVIII.—CYPERACEÆ.

588. *Liphocarpa argentea* *R. Br.*

Myitkyina (C). Tropical and sub-tropical regions of the Eastern Hemisphere.

589. *Bulbostylis capillaris* *Kunth.* VAR. *trifida* *Clarke.*

Namlao (E). DISTRIB. (of variety.) Warmer regions of the Eastern Hemisphere.

590. *Carex baccans* *Nees.*

Neochawng, 700 ft. (E). DISTRIB. India; E. Himalaya; Assam Ranges; China; Malay Islands; not before collected in Burma.

591. *Carex cruciata* *Vahl.*

Myitkyina (C). DISTRIB. Eastern Himalaya; Assam Ranges; Malaya; China; Madagascar; not before collected in Burma.

592. *Carex filicina* *Nees.*

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. India ; Assam Ranges ; China ; Java.

593. *Carex spiculata* Nees.

Lammuk, 2,500 ft. (E). DISTRIB. E. Himalaya ; Assam Ranges ; not before sent from Burma.

594. *Carex stramentitia* Boott.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Bihar ; Himalaya ; Assam Ranges ; not before sent from Burma.

595. *Carex Thomsoni* Boott.

Myitkyina (E). DISTRIB. Himalaya ; Assam Ranges ; Indo-China.

#### XCIX.—GRAMINEÆ.

596. *Setaria italica* Beauv.

Generally cultivated in the Kachin villages at elevations of over 3,500 ft. ; specimens from Palá (E), and elsewhere (C). DISTRIB. Cultivated in most warm countries.

[*Oryza sativa* Linn.—Generally cultivated : wet-rice cultivation ceases north of Kwit, except in the Nachawng Kha Valley, between the villages of Galing and Pelap ; dry-rice is grown very generally below 3,500 ft. throughout the hills.]

597. *Coix Lachryma* Linn.

Namlao (C). DISTRIB. Wild in S. E. Asia, cultivated in Tropics generally.

The cultivation of this species as a cereal crop, which is so striking a feature in the agricultural economy of the tribes that inhabit the mountains between the Brahmaputra and the Chindwin rivers, is conspicuous by its absence from the Kachin Hills.

[*Zea Mays* Linn.—Generally grown at elevations above 3,500 ft. ; the use of this grain appears to have been derived from the Chinese.]

598. *Anthistiria scandens* Roxb.

Namlao (E). DISTRIB. India ; Indo-China ; Malaya ; Mascarene Islands.

[*Eleusine Coracana* Gaertn.—Very generally cultivated above 3,500 ft. ]

599. *Dendrocalamus Brandisii* Kurz.

Namlao, 2,000 to 2,500 feet (E). DISTRIB. Burma.

600. *Pseudostachyum polymorphum* Munro.

Myitkyina (C) DISTRIB. Eastern Himalaya ; Assam ; Burma.

601. *Cephalostachyum Fuchsianum* Gamble.

Myitkyina (C). DISTRIB. Sikkim ; Bhutan ; Daphla.

An interesting eastward extension of this rather rare species.

[In addition to the foregoing a species of *Arundinaria* was very plentiful on the mountains near the Chinese frontier crossed by Lieutenant Pottinger's party. Several other Bamboos were seen, but, not being in flower, specimens were not collected.]

## CRYPTOGAMIA.

### C.—EQUISETACEÆ.

602. *Equisetum debile* *Roxb.*

Namlao (E). DISTRIB. South-Eastern Asia.

603. *Equisetum diffusum* *Don.*

Myitkyina (C). DISTRIB. Himalaya; Manipur; previously collected in the Taping Valley by Dr. J. Anderson, but not hitherto sent from any other part of Burma.

### CI.—LYCOPODIACEÆ.

604. *Lycopodium cernuum* *Linn.*

Banks of the 'Nmai Kha, 900 ft. (E). DISTRIB. Cosmopolitan in the Tropics.

### CII.—SELAGINELLACEÆ.

605. *Selaginella canaliculata* *Baker.*

Namlao (E); Bansparao 2,000 ft. (E); Myitkyina (E); also very plentiful along the upper reaches of the Nachawng Kha. DISTRIB. East Himalaya; Indo-China; China; Malaya.

606. *Selaginella picta* *A. Br.*

Nawgo Kha, 1,300 to 2,000 ft. (E). DISTRIB. Assam Ranges; Mishmi Hills; not before sent from Burma.

607. *Selaginella Wallichii* *Spreng.*

Nawgo Kha, 1,300 to 2,000 feet; also-plentiful in the Upper Nachawng Kha Valley (E). DISTRIB. Eastern Himalaya; Indo-China; Malaya; New Guinea.

### C III—FILICES.

608. *Davallia chinensis* *Sw.*

Myitkyina (C). DISTRIB. Tropics of Old World.

609. *Davallia Griffithiana* *Hook.*

Lammuk, 2,400 ft. (E); Kepio, 2,900 ft. (E) DISTRIB. Assam Ranges; China; Burma; Malaya.

610. *Onychium auratum* *Kaulf.*

Myitkyina (C). DISTRIB. Himalaya; Indo-China; Malaya.

611. *Pteris biaurita* *Wall.*

Bansparao, 2,000 ft. (E). DISTRIB. Cosmopolitan in the Tropics.

612. *Blechnum orientale* Linn.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Himalaya ; China ; Indo-China ; Malaya ; Australia.

613. *Asplenium Finlaysonianum* Wall.

'Nsentalu, 600 ft. (E). DISTRIB. Himalaya ; Indo-China ; Malaya.

614. *Asplenium planicaule* Wall.

Neochawng, 7,000 ft. (E). DISTRIB. India ; Himalaya ; not before collected in Burma.

615. *Aspidium aristatum* Sw

Phalè, 1,300 to 3,300 ft. (E). DISTRIB. Japan ; China ; Himalaya ; India ; Polynesia ; Australia ; Natal.

616. *Nephrodium falcilobum* Hook.

Myitkyina (E). DISTRIB. India ; Indo-China ; China ; Malaya.

617. *Nephrodium Leuzeanum* Hook.

Lammuk, 2,500 ft. (E). DISTRIB. Himalaya ; Indo-China ; China ; Malaya ; Polynesia.

618. *Nephrodium membranifolium* Presl.

Namli, 2,000 ft. (E). DISTRIB. India ; Indo-China ; Malaya ; Polynesia ; Madagascar.

619. *Nephrodium variolosum* Hook. & Bak.

Patzam, 1,100 ft. (E). DISTRIB. India ; Indo-China ; Malaya.

620. *Polypodium leiorrhizon* Wall.

'Nsentalu, 600 ft. (E). DISTRIB. Himalaya ; Assam Ranges ; not before collected in Burma.

621. *Gymnogramme javanica* DC.

Ningting, 800 ft. (E). DISTRIB. Tropics of Old World.

622. *Antrophyum plantagineum* Kaulf.

Bansparao, 2,000ft. (E). DISTRIB. Ceylon ; Himalayas ; Assam ; Indo-China ; Malaya ; Polynesia.

623. *Acrostichum appendiculatum* Willd.

Bansparao, 2,000 ft. (E). DISTRIB. India ; Indo-China ; China ; Malaya.

624. *Platyserium Wallichii* Hook.

Myitkyina (E) ; Bansparao, 2,000 ft. (E). DISTRIB. Assam Ranges ; Malaya.

625. *Lygodium pinnatifidum* Sw.

Namlao to Bansparao, 500 to 2,000 ft. (E). DISTRIB. Tropics of Old World.

[*Osmunda regalis* Linn.—This was very plentiful in the upper valley of the Nachawng Kha.]

626. *Helminthostachys zeylanica* Linn.

Myitkyina (C). DISTRIB. South-Eastern Asia and Australia.

627. *Ophioglossum vulgatum* Linn.

Myitkyina (C). DISTRIB. Cosmopolitan.

#### § 4.—NATURE AND RELATIONSHIPS OF THE KACHIN FLORA.

[D. PRAIN.]

Though the collection dealt with in this paper is no doubt only a partial one, a perusal of the list of species will show that it possesses considerable interest. This interest depends to some extent on the fact that no previous collection has been made in this particular district; it is, however, intensified by the geographical position of the region whence the species are derived. The Kachin Hills constitute, roughly speaking, the upper catchment-area of the river Irrawaddy, which was formerly supposed to derive at least some part of its waters from the Tibetan table-land but which we now know to have no trans-Himalayan tributaries. Though the botany of the Kachin Hills proper has remained till now quite uninvestigated, collections have been made in the Hukung Valley immediately to the west and in the Taping Valley immediately to the south-east; the former by Dr. Griffith, the latter by Dr. J. Anderson. The Hukung Valley plants of Griffith have been, in the majority of instances, dealt with in the *Flora of British India*; those from the Taping Valley, owing to their place of origin being, politically, part of China, are enumerated in the *Index Sinensis* of Forbes and Hemsley. These Taping Valley plants, as an examination of our Kachin list will show, are, however, only accidentally Chinese. Of the 627 plants enumerated, 173, or about  $\frac{5}{8}$ ths (more accurately 27·59 per cent.) of the whole, occur in the Taping Valley, though less than half of these (only 78) have been found in China outside the limits of this particular valley. Nor is this all; two-thirds of the plants that do occur in China outside this valley are in no sense characteristic of any particular portion of South-Eastern Asia, since they occur in Indo-China, Malaya, the Himalayas, Assam and India, as well as in China. As a matter of fact, only five of the plants that are common to the Kachin Hills and the Taping Valley extend eastward to China without occurring in Eastern Indo-China as well, and two of these four are not distinctively Chinese plants, since they occur in Assam as well as in China; one of the two appearing in the Eastern Himalaya as well. Nor has the Taping Valley any more marked affinity with the

Indo-Chinese countries lying east of the Irrawaddy Valley; though as many as 137 of the 173 plants common to the Kachin Hills and the Taping Valley occur on the Shan Plateau as well, more than one-third of these are distributed to all parts of South-Eastern Asia, and there are only four species that are peculiar to the Kachin Hills, the Taping Valley and the Shan Hills.

In strong contrast with this parsimony of Chinese and of eastern Indo-Chinese influence in the Taping Valley flora, as represented by those species that this valley shares with the Kachin Hills, stands the fact that no fewer than 16 of these 173 species are plants that are distinctive of the Eastern Himalaya, or of the Assam Ranges, or of both, and that find their eastern limit of distribution, so far as is now known, in the Taping Valley. At the same time no fewer than five species are peculiar to the Kachin Hills and the Taping Valley, so that the conjoined Kachin-Taping area, though immediately bordering on China and the Shan Plateau, exhibits an endemic element that exceeds numerically the Chinese and Shan elements respectively, and yet hardly exceeds in strength one-third the element derived from the more remote Himalo-Assamese areas. These facts render it advisable to include the Taping Valley in the natural phytogeographical area to which the Kachin Hills proper belong, and this annexation has the further advantage of according with the physiographical features of the region. The Taping Valley constitutes an integral portion of the catchment-area of the Irrawaddy, and is separated from the river-systems of China by the mountain-ranges that at once confine and separate the narrow gorges occupied by the Salween and the Mekong.

Physiographical considerations lead equally to the suggestion that the Hukung Valley may also be best conjoined with the Kachin Hills as a preliminary measure, and an examination of the table of distribution of our Kachin plants, where the Hukung and Taping species present in the Herbarium at Calcutta are indicated, bears out this idea. There are 34 species in the list that are known to have been obtained by Griffith in the Hukung Valley, and it is possible that still another (*Eugenia Griffithii*) may have come from there. Twenty of these species, or rather more than half, extend both westward into Assam, the Himalayas or India, and eastward into China, Indo-China, or Malaya, and thus throw no light on the affinities of the Hukung flora, but while there is only one that does not occur elsewhere save in the countries east of the Irrawaddy basin, no fewer than nine extend only westward, and as many as four are confined to the Irrawaddy catchment-area. Of the 13 plants that are either confined to this area or

that extend only westward from it, there are four that occur both in the Hukung and Taping Valleys, as well as in the central portion of the Kachin country.

It seems then safe to conclude that the catchment-area of the Upper Irrawaddy admits of being dealt with as a natural phytogeographical entity, and that the plan of considering its eastern portion as Chinese and its western as Burmese must be abandoned. The question now to be settled is the precise relationship of this conjoint Hukung-Kachin-Taping district. Situated as it is where at least three well-marked phytogeographical sub-sub-areas—those of China, Indo-China and the Eastern Himalaya—meet, it may not inconceivably be referable to any one of these, and from its position may even throw light on the relationships these bear to each other. The writer has, on more than one occasion, had reason to express his belief, based on an examination of the distributional features in particular genera like *Pedicularis* and *Gomphostemma*, that the hitherto accepted sub-division of Western Indo-China into a northern half termed Ava and a southern half termed Pegu, is at variance alike with physiographical and phytogeographical facts, and is as inconvenient as it is incorrect. The facts reviewed by him elsewhere have led to a proposal to treat as a natural sub-sub-area the block of mountainous country that intervenes between the valleys of the Brahmaputra river to the north and west, and of the Irrawaddy river to the east. This block certainly includes the hill-ranges known as the Patkoi, Barel, Khasi, Chin-Lushai, Chittagong and Arracan, and ends towards the south in the Andaman Islands, and in this sense possesses a natural rank equivalent to that of the Eastern Himalaya from the Sarju Valley, 82°E. Lon., to the Dihong Gorge, 95°E. Lon. The Mishmi-Kachin block, between the gorges of the Dihong and the Salwen, 95°E. Lon. to 99°E. Lon., may conceivably be referable to either one or other of the sub-sub-areas mentioned, but it may equally conceivably be regarded either as central Indo-Chinese—the tract of mountainous country intervening between the valleys of the Irrawaddy and the Mekong—or as south-west Chinese. The unexplored character of the block in question has hitherto rendered any opinion on the point more or less conjectural; in order to test the extent to which our present Kachin collection lends itself to the elucidation of this point, the distributional features of its elements have been tabulated so as to show the extension of each species westward into the Assam-Arracan sub-sub-area, and into the sub-sub-area of the Eastern Himalaya, beyond these into India;

eastward into China and into Eastern Indo-China, beyond Indo-China into the Malay countries.

The list in which the facts of distribution are shown is followed by a synoptical view of the distributional features from which the various influences may be readily calculated. In the synoptic table, the words Shan and Assam are, for the sake of brevity, used in place of the expressions "Eastern Indo-China" and "Arracan-Assam" respectively.

A sketch map, to show the geographical relationship of the Kachin Hills to adjacent areas has been added. This map is based on Stieler's Hand-Atlas, maps No. 66 and No. 67; the only deviation from those maps being that the Upper Irrawaddy, eastern branch, is in the sketch shown as not rising in Tibet. When Stieler's maps were published it was supposed to do so; this is now known not to be the case.

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	—	<i>Thalictrum foliolosum</i> . . .	—	—	—	—
x	x	x	—	<i>Anemone rivularis</i> . . .	x	—	x	—
—	x	x	—	<i>Clematis acuminata</i> . . .	x	—	x	—
—	—	—	—	<i>Dillenia pulcherrima</i> . . .	—	—	x	—
—	—	x	—	<i>Unona dumosa</i> . . .	—	—	—	x
—	—	—	—	<i>Goniotalamus peduncularis</i> . . .	—	—	—	—
—	x	x	—	<i>Miliusa macrocarpa</i> . . .	—	—	—	—
—	x	x	—	<i>Parabæna sagittata</i> . . .	x	—	x	—
x	x	x	—	<i>Pericampylus incanus</i> . . .	x	x	x	x
—	—	—	—	<i>Cyclea</i> sp. . . .	x	—	—	—
—	—	x	—	<i>Brassica juncea</i> VAR. <i>agrestis</i> . . .	x	x	—	—
x	x	x	—	<i>Gynandropsis leptophylla</i> . . .	x	x	x	x
—	—	x	—	<i>Capparis sabiæfolia</i> . . .	—	—	—	—
x	—	x	x	<i>Capparis tenera</i> . . .	—	—	x	—
—	—	—	x	<i>Roydsia parviflora</i> . . .	—	—	—	—
—	—	x	—	<i>Cratæva lophosperma</i> . . .	—	—	—	—
—	x	x	—	<i>Salomonina cantoniensis</i> . . .	—	x	x	x
x	x	x	—	<i>Polygala arillata</i> . . .	—	x	x	—
x	x	x	—	<i>Polygala leptalea</i> . . .	—	—	x	—
—	—	x	—	<i>Securidaca tavoyana</i> . . .	—	x	x	x
—	—	x	—	<i>Xanthophyllum glaucum</i> . . .	—	—	x	x
x	x	x	—	<i>Stellaria media</i> . . .	—	x	x	x
—	—	x	—	<i>Hypericum patulum</i> . . .	x	x	—	—
—	—	x	—	<i>Garcinia lanceæfolia</i> . . .	—	—	—	—
—	—	x	x	<i>Saurauja macrotricha</i> . . .	x	—	—	—
—	x	x	—	<i>Saurauja Roxburghii</i> . . .	—	—	x	—
—	—	x	—	<i>Camellia Thea</i> . . .	—	?	?	—
—	—	x	—	<i>Anneslea fragrans</i> . . .	—	—	x	—
—	x	x	x	<i>Eurya acuminata</i> VAR. <i>euprista</i> . . .	x	—	x	x
—	—	—	—	<i>Shorea siamensis</i> . . .	—	—	x	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
x	x	x	—	<i>Kydia calycina</i> . . . .	x	—	x	—
x	x	x	—	<i>Abutilon indicum</i> . . . .	—	x	x	x
x	x	x	—	<i>Urena lobata</i> . . . .	x	x	x	x
—	x	x	—	<i>Hibiscus cancellatus</i> . . . .	x	—	x	—
—	—	x	—	<i>Hibiscus macrophyllus</i> . . . .	—	—	x	x
x	x	x	—	<i>Thespesia Lampas</i> . . . .	x	—	x	x
x	x	x	—	<i>Bombax malabaricum</i> . . . .	—	x	x	x
—	x	x	—	<i>Sterculia coccinea</i> . . . .	x	—	x	—
—	—	—	—	<i>Sterculia cognata</i> . . . .	—	—	—	—
x	x	x	—	<i>Sterculia colorata</i> . . . .	—	—	x	—
—	x	x	x	<i>Helicteres glabriuscula</i> . . . .	x	—	x	—
x	—	—	—	<i>Helicteres Isora</i> . . . .	—	—	—	x
—	—	x	—	<i>Buettneria pilosa</i> . . . .	x	—	x	—
—	x	x	—	<i>Grewia elastica</i> . . . .	—	—	x	—
x	—	—	—	<i>Grewia hirsuta</i> . . . .	—	x	—	—
—	x	x	—	<i>Grewia sapida</i> . . . .	—	—	—	—
x	x	x	x	<i>Triumfetta pilosa</i> . . . .	x	x	x	x
—	—	x	—	<i>Elæocarpus Braceanus</i> . . . .	—	—	—	—
x	x	x	—	<i>Reinwardtia trigyna</i> . . . .	—	x	x	^
—	—	x	—	<i>Hiptage candicans</i> . . . .	—	—	x	—
—	—	x	—	<i>Impatiens bella</i> . . . .	—	—	—	—
—	p	?	—	<i>Impatiens latiflora</i> . . . .	x	—	—	—
—	x	x	—	<i>Impatiens leptoceras</i> . . . .	—	—	—	—
—	x	x	—	<i>Impatiens puberula</i> . . . .	—	—	—	—
—	x	x	—	<i>Clausena excavata</i> . . . .	x	—	x	x
—	x	x	—	<i>Micromelum pubescens</i> . . . .	x	—	x	x
x	x	x	x	<i>Toddalia aculeata</i> . . . .	—	x	x	x
—	x	x	—	<i>Zanthoxylum acanthopodium</i> . . . .	—	—	—	—
x	x	x	—	<i>Zanthoxylum ovalifolium</i> . . . .	—	—	—	—
x	x	x	—	<i>Acronychia laurifolia</i> . . . .	—	x	x	^

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
x	x	x	—	<i>Citrus medica</i> . . . . .	x	x	x	—
—	x	x	—	<i>Brucea mollis</i> . . . . .	x	—	x	—
x	x	x	—	<i>Garuga pinnata</i> . . . . .	x	—	x	x
x	—	x	—	<i>Protium serratum</i> . . . . .	—	—	x	—
—	—	?	—	<i>Dysoxylum grande</i> ? . . . . .	—	—	—	—
—	x	—	—	<i>Lansium decandrum</i> . . . . .	—	—	—	?
x	x	x	—	<i>Cedrela Toona</i> . . . . .	—	—	x	—
—	x	x	—	<i>Olex acuminata</i> . . . . .	x	—	—	—
—	x	x	—	<i>Schoepfia fragrans</i> . . . . .	—	—	—	—
—	—	x	—	<i>Cardiopteris lobata</i> . . . . .	x	—	x	x
x	x	x	—	<i>Celastrus paniculatus</i> . . . . .	—	—	x	x
—	x	x	—	<i>Microtropis discolor</i> . . . . .	—	—	x	—
—	—	—	—	<i>Gymnosporia pallida</i> . . . . .	—	—	x	—
x	x	x	x	<i>Zizyphus rugosa</i> . . . . .	x	—	x	?
—	—	—	—	<i>Zizyphus</i> ? sp. . . . .	x	—	—	—
—	x	x	x	<i>Rhamnus nipalensis</i> . . . . .	—	—	x	—
—	—	x	—	<i>Vitis augustifolia</i> . . . . .	—	—	x	x
x	x	x	—	<i>Vitis lanceolata</i> . . . . .	—	—	x	x
—	x	x	—	<i>Vitis oxyphylla</i> . . . . .	—	—	—	—
?	x	x	—	<i>Vitis repens</i> . . . . .	—	x	x	x
x	x	x	—	<i>Allophylus</i> Cobbe VAR. <i>glabra</i> . . . . .	—	x	x	x
—	—	—	—	<i>Lepisanthes burmannica</i> . . . . .	—	—	x	—
x	x	x	—	<i>Meliosma simplicifolia</i> . . . . .	—	—	x	—
—	—	—	—	<i>Tæniocladia birmanica</i> . . . . .	—	—	—	—
x	x	x	—	<i>Crotalaria alata</i> . . . . .	—	—	x	x
—	x	x	—	<i>Crotalaria ferruginea</i> . . . . .	—	x	x	x
—	x	x	—	<i>Indigofera atropurpurea</i> VAR. <i>nigrescens</i> . . . . .	—	—	x	—
—	x	x	—	<i>Millettia pachycarpa</i> . . . . .	—	—	x	—
—	—	—	—	<i>Millettia puerarioides</i> . . . . .	x	—	x	—
—	—	x	—	<i>Millettia pulchra</i> . . . . .	x	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	—	—	<i>Wistaria chinensis</i> . . .	—	x	—	—
x	x	x	—	<i>Desmodium cephalotes</i> . . .	—	x	x	x
x	x	x	—	<i>Desmodium gangeticum</i> . . .	—	x	x	x
—	x	x	—	<i>Desmodium gyroides</i> . . .	x	x	x	x
x	x	x	—	<i>Desmodium latifolium</i> . . .	x	x	x	x
x	x	x	—	<i>Desmodium laxiflorum</i> . . .	x	x	x	x
—	—	—	—	<i>Desmodium oblongum</i> . . .	—	—	x	—
—	x	x	—	<i>Desmodium oxyphyllum</i> . . .	—	x	—	—
x	x	x	—	<i>Desmodium parvifolium</i> . . .	—	x	x	x
x	x	x	—	<i>Desmodium polycarpum</i> . . .	x	x	x	x
—	x	x	—	<i>Desmodium pseudo-triquetrum</i> . . .	—	—	—	—
x	x	x	x	<i>Desmodium pulchellum</i> . . .	x	x	x	x
x	—	x	—	<i>Desmodium Scalpe</i> . . .	—	—	—	x
—	x	—	—	<i>Desmodium tiliaefolium</i> . . .	—	—	—	—
x	—	x	—	<i>Desmodium triquetrum</i> . . .	x	x	x	x
?	?	x	—	<i>Uraria crinita</i> . . .	x	x	x	x
x	x	x	—	<i>Uraria hamosa</i> . . .	—	x	x	x
—	—	x	—	<i>Uraria lagopoides</i> . . .	—	x	x	x
x	x	x	—	<i>Uraria picta</i> . . .	x	x	x	x
—	x	x	—	<i>Abrus pulchellus</i> . . .	—	—	x	x
—	—	—	—	<i>Lespedeza parviflora</i> . . .	—	x	x	—
—	—	—	—	<i>Erythrina stricta</i> . . .	—	—	x	—
x	x	x	—	<i>Shuteria vestita</i> . . .	—	x	x	x
—	x	x	—	<i>Mucuna macrocarpa</i> . . .	+	—	x	—
—	—	—	—	<i>Spatholobus Pottingeri</i> . . .	—	—	—	—
—	—	—	—	<i>Crudasia insignis</i> . . .	—	—	—	—
—	—	—	—	<i>Pueraria bella</i> . . .	—	—	—	—
—	—	x	—	<i>Pueraria Candollei</i> . . .	—	—	x	—
x	x	x	—	<i>Pueraria phaseoloides</i> VAR <i>javanica</i>	—	—	—	x
—	x	x	—	<i>Pueraria subspicata</i> . . .	—	—	+	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	—	<i>Pueraria Thunbergiana</i> . . .	—	x	—	—
x	x	x	—	<i>Canavalia ensiformis</i> VAR <i>virosa</i> . . .	—	x	x	x
x	x	x	—	<i>Phaseolus calcaratus</i> . . .	—	—	x	x
x	x	x	—	<i>Vigna pilosa</i> . . .	—	—	x	—
x	x	x	—	<i>Dolichos Lablab</i> . . .	x	x	x	x
—	—	—	—	<i>Dunbaria fusca</i> . . .	—	—	x	—
x	x	x	—	<i>Flemingia congesta</i> . . .	x	x	x	x
x	x	x	—	<i>Flemingia semialata</i> . . .	—	—	—	—
—	—	—	—	<i>Dalbergia Kingiana</i> . . .	—	—	—	—
—	x	x	—	<i>Dalbergia rimosa</i> . . .	—	—	—	—
—	x	x	—	<i>Dalbergia stipulacea</i> . . .	—	—	x	—
—	—	—	—	<i>Derris latifolia</i> . . .	—	—	—	—
x	x	x	—	<i>Mezoneuron cucullatum</i> . . .	—	—	x	—
x	x	x	—	<i>Cassia Fistula</i> . . .	—	—	x	x
—	?	x	—	<i>Cassia nodosa</i> . . .	—	—	x	x
—	—	—	—	<i>Bauhinia Pottingeri</i> . . .	—	—	—	—
x	x	x	—	<i>Bauhinia variegata</i> . . .	x	x	x	—
—	x	x	—	<i>Calliandra umbrosa</i> . . .	—	—	—	—
x	x	x	—	<i>Acacia pennata</i> . . .	—	—	x	x
—	—	x	x	<i>Acacia pruinescens</i> . . .	x	—	—	—
—	x	x	—	<i>Albizzia lucida</i> . . .	x	—	x	—
—	x	x	—	<i>Pithecolobium angulatum</i> . . .	—	—	x	x
x	x	x	—	<i>Pithecolobium bigeminum</i> . . .	—	—	—	—
—	x	x	—	<i>Prunus acuminata</i> . . .	—	—	—	—
—	x	x	—	<i>Prunus persica</i> . . .	x	x	x	—
—	x	x	—	<i>Prunus Puddum</i> . . .	x	—	x	—
—	x	x	—	<i>Neillia thyrsiflora</i> . . .	—	—	—	x
—	x	x	—	<i>Rubus hexagynus</i> . . .	x	—	x	—
x	x	x	—	<i>Potentilla Kleiniana</i> . . .	x	x	+	x
—	x	x	—	<i>Agrimonia Eupatorium</i> . . .	x	x	x	?

India.	Himalaya.	Arracan-Assam.	Huking Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
x	x	x	—	<i>Rosa involucrata</i> . . . . .	x	—	x	—
—	—	x	—	<i>Photinia Notoniana</i> VAR <i>macrophylla</i>	—	—	—	—
—	x	—	—	<i>Hydrangea robusta</i> VAR <i>Griffithii</i> .	—	—	—	—
—	—	—	—	<i>Hydrangea Pottingeri</i> . . . . .	—	—	—	—
—	x	x	—	<i>Dichroa febrifuga</i> . . . . .	—	x	x	x
—	—	—	—	<i>Escallonearum gen. nov.</i> . . . . .	—	—	—	—
—	x	x	—	<i>Itea macrophylla</i> . . . . .	—	—	—	x
—	x	x	—	<i>Altingia excelsa</i> . . . . .	+	—	x	x
—	—	—	—	<i>Terminalia argyrophylla</i> . . . . .	—	—	—	—
x	x	x	—	<i>Terminalia Chebula</i> . . . . .	—	—	x	x
—	x	x	—	<i>Terminalia myriocarpa</i> . . . . .	x	—	x	—
x	—	x	—	<i>Calcypteris floribunda</i> . . . . .	—	—	x	x
—	—	—	—	<i>Eugenia claviflora</i> . . . . .	—	—	x	x
—	—	x	?	<i>Eugenia Griffithi</i> . . . . .	—	—	—	?
—	x	x	—	<i>Eugenia obovata</i> . . . . .	—	—	x	—
x	x	x	—	<i>Osbeckia chinensis</i> . . . . .	x	x	x	x
x	x	x	—	<i>Melastoma malabathricum</i> . . . . .	—	—	—	—
—	x	x	—	<i>Melastoma normale</i> . . . . .	x	—	x	—
—	x	x	—	<i>Oxyspora paniculata</i> . . . . .	—	—	—	—
—	x	x	—	<i>Sonerila maculata</i> . . . . .	—	—	x	—
x	x	x	—	<i>Woodfordia floribunda</i> . . . . .	x	x	x	—
—	x	x	x	<i>Lagerstroemia parviflora</i> VAR. <i>ben-galensis</i>	—	—	—	—
x	x	x	—	<i>Punica Granatum</i> . . . . .	x	x	x	x
x	x	x	—	<i>Casearia graveolens</i> . . . . .	—	x	—	—
—	x	x	—	<i>Hodgsonia heteroclita</i> . . . . .	—	—	x	—
x	x	x	—	<i>Trichosanthes palmata</i> . . . . .	x	—	x	x
x	x	x	—	<i>Trichosanthes Wallichiana</i> . . . . .	x	x	x	x
—	x	x	—	<i>Gymnopetalum cochinchinense</i> . . . . .	—	x	x	x
—	—	—	—	<i>Alsomitra pabigera</i> . . . . .	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	x	—	<i>Thladiantha Hookeri</i> . . .	—	—	—	—
—	x	x	—	<i>Begonia barbata</i> . . .	—	—	x	—
—	x	x	—	<i>Begonia gigantea</i> . . .	—	—	—	—
x	x	x	—	<i>Hydrocotyle javanica</i> . . .	—	x	x	x
—	x	—	—	<i>Heracleum Wallichii</i> . . .	—	—	—	—
—	x	x	—	<i>Aralia armata</i> . . .	—	—	x	x
—	—	—	—	<i>Heptapleurum Lawranceanum</i> . .	—	—	—	—
—	x	x	—	<i>Marlea begoniæfolia</i> . . .	—	x	x	—
—	—	—	—	<i>Mastixia euonymoides</i> . . .	—	—	—	—
—	—	—	—	<i>Alangium Kingianum</i> . . .	—	—	—	—
—	—	x	—	<i>Sambucus javanica</i> . . .	x	x	x	x
—	x	x	—	<i>Viburnum coriaceum</i> . . .	x	x	x	x
—	—	x	—	<i>Lonicera japonica</i> . . .	—	x	—	—
—	—	x	—	<i>Adina sessilifolia</i> . . .	—	—	x	—
—	x	x	—	<i>Uncaria macrophylla</i> . . .	—	—	—	—
—	x	x	—	<i>Uncaria sessilifructus</i> . . .	x	—	x	—
—	x	—	—	<i>Luculia gratissima</i> . . .	—	—	x	—
—	—	x	—	<i>Wendlandia paniculata</i> . . .	x	x	x	x
—	x	x	x	<i>Wendlandia tinctoria</i> . . .	—	—	x	?
—	—	x	—	<i>Hedyotis capitellata</i> . . .	x	—	x	x
x	x	x	—	<i>Hedyotis hispida</i> . . .	x	x	x	x
—	x	x	—	<i>Hedyotis scandens</i> . . .	x	—	x	—
—	x	x	—	<i>Anotis ingrata</i> . . .	—	—	—	—
—	—	x	—	<i>Spiradiclis cylindrica</i> . . .	—	—	—	—
x	—	x	—	<i>Ophiorrhiza Harrisiana</i> VAR. <i>argentea</i>	—	—	—	—
—	—	x	—	<i>Ophiorrhiza hispida</i> . . .	—	—	—	—
—	—	—	—	<i>Ophiorrhiza Lawranceana</i> . .	—	—	—	—
—	x	x	—	<i>Carlemannia Griffithii</i> . . .	—	—	—	—
—	x	x	—	<i>Mussaenda Roxburghii</i> . . .	—	—	—	—
—	—	—	—	<i>Mussaenda</i> sp. . . .	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	x	<i>Randia Wallichii</i> . . . .	x	—	x	x
—	—	—	—	<i>Gardenia erythroclada</i> . . . .	—	—	x	—
—	—	x	—	<i>Coffea Jenkinsii</i> . . . .	—	—	—	—
—	x	x	—	<i>Morinda angustifolia</i> . . . .	x	—	x	—
—	—	x	—	<i>Psychotria adenophylla</i> . . . .	—	—	x	—
—	x	x	—	<i>Psychotria calocarpa</i> . . . .	x	—	x	—
—	x	x	—	<i>Psychotria erratica</i> . . . .	—	—	—	—
x	x	x	—	<i>Chasalia curviflora</i> . . . .	—	—	x	x
—	—	x	—	<i>Lasianthus Wallichii</i> . . . .	—	x	x	—
—	—	—	—	<i>Pæderia Cruddasiana</i> . . . .	—	—	—	—
x	—	x	—	<i>Vernonia arborea</i> . . . .	—	—	x	x
x	x	x	—	<i>Vernonia cinerea</i> . . . .	x	x	x	x
—	x	x	—	<i>Vernonia scandens</i> . . . .	—	—	x	—
—	x	x	—	<i>Vernonia volkameriæfolia</i> . . . .	x	—	x	—
x	x	x	—	<i>Adenostemma viscosum</i> VAR. <i>elata</i> . . . .	x	x	x	x
x	x	x	—	<i>Dichrocephala latifolia</i> . . . .	x	x	x	x
—	x	x	—	<i>Blumea balsamifera</i> . . . .	x	x	x	x
—	x	x	—	<i>Blumea chinensis</i> . . . .	—	x	x	x
—	x	x	—	<i>Blumea myriocephala</i> . . . .	x	x	x	—
x	x	x	—	<i>Laggera flava</i> . . . .	x	x	x	x
x	x	x	—	<i>Gnaphalium indicum</i> . . . .	x	x	x	—
x	x	—	—	<i>Vicoa auriculata</i> . . . .	x	—	x	—
—	—	x	—	<i>Cotula hemisphærica</i> . . . .	x	x	x	—
x	x	x	—	<i>Spilanthes Acmella</i> VAR. <i>calva</i> . . . .	x	—	x	—
x	x	x	—	<i>Artemisia vulgaris</i> . . . .	x	x	x	x
—	x	x	—	<i>Emilia prenanthoidea</i> . . . .	x	—	—	—
x	x	x	—	<i>Senecio araneosus</i> . . . .	—	—	—	x
—	—	x	—	<i>Senecio yunnanensis</i> . . . .	x	—	—	—
—	x	x	—	<i>Pratia begoniifolia</i> . . . .	—	x	x	x
—	x	x	—	<i>Lobelia affinis</i> . . . .	—	x	x	x

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	—	<i>Lobelia rosea</i> . . . . .	x	—	x	—
x	x	x	—	<i>Wahlenbergia gracilis</i> . . . . .	—	x	x	x
—	x	x	—	<i>Campanumcea parviflora</i> . . . . .	—	—	x	—
—	—	—	—	<i>Agapetes Pottingeri</i> . . . . .	—	—	—	—
—	—	x	—	<i>Desmogyne nerifolia</i> . . . . .	—	—	—	—
—	x	x	—	<i>Pieris ovalifolia</i> . . . . .	x	x	x	—
—	—	—	—	<i>Rhododendron indicum</i> . . . . .	x	x	—	—
—	—	—	—	<i>Lysimachia evalvis</i> VAR. <i>latifolia</i> . . . . .	—	—	—	—
—	x	x	x	<i>Lysimachia ramosa</i> . . . . .	—	—	—	—
—	—	—	—	<i>Ardisia crenata</i> . . . . .	—	x	x	x
—	—	x	—	<i>Ardisia virens</i> . . . . .	x	—	—	—
—	—	—	x	<i>Pimelandra Griffithii</i> . . . . .	—	—	—	—
—	x	x	x	<i>Sarcosperma arboreum</i> . . . . .	—	—	x	—
x	x	x	—	<i>Symplocos racemosa</i> . . . . .	—	x	x	—
—	x	x	—	<i>Jasminum anastomosans</i> . . . . .	—	—	x	—
—	—	—	—	<i>Jasminum decussatum</i> . . . . .	—	—	x	—
—	x	x	—	<i>Jasminum scandens</i> . . . . .	—	—	x	—
—	—	—	—	<i>Rauwolfia chinensis</i> . . . . .	—	x	—	—
x	x	x	—	<i>Alstonia scholaris</i> . . . . .	—	—	x	x
x	x	x	—	<i>Tabernaemontana coronaria</i> . . . . .	x	x	x	x
x	x	x	—	<i>Holarrhena antidysenterica</i> . . . . .	—	—	x	x
x	x	x	—	<i>Vallaris Heynei</i> . . . . .	x	—	x	—
—	—	x	—	<i>Pottsia cantoniensis</i> . . . . .	—	x	x	x
—	—	x	—	<i>Aganosma cymosum</i> . . . . .	—	—	—	—
—	x	x	—	<i>Periploca calophylla</i> . . . . .	—	x	—	—
—	—	x	—	<i>Myriopterion paniculatum</i> . . . . .	—	—	x	x
x	x	x	—	<i>Asclepias Curassavica</i> . . . . .	x	x	x	x
—	x	x	—	<i>Cynanchum corymbosum</i> . . . . .	x	—	x	x
—	—	x	x	<i>Pentasacme candatum</i> . . . . .	—	—	x	—
—	x	x	—	<i>Hoya longifolia</i> . . . . .	—	—	—	—

India.	Himalaya.	Arracan-Asam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	x	—	<i>Hoya parasitica</i> . . . .	—	—	x	x
—	x	x	—	<i>Ceropegia pubescens</i> . . . .	—	—	—	—
—	—	x	x	<i>Gelsemium elegans</i> . . . .	x	x	—	x
x	x	x	—	<i>Buddleia asiatica</i> . . . .	x	x	x	x
—	x	x	—	<i>Exacum teres</i> . . . .	—	—	—	—
x	x	x	—	<i>Exacum tetragonum</i> . . . .	—	x	—	—
—	x	x	—	<i>Cynoglossum micranthum</i> . . . .	—	x	x	—
—	x	x	—	<i>Ipomœa linifolia</i> . . . .	—	—	x	x
x	x	x	x	<i>Ipomœa vitifolia</i> . . . .	x	—	x	x
x	x	x	—	<i>Evolvulus alsinoides</i> . . . .	—	x	x	x
x	x	x	—	<i>Porana paniculata</i> . . . .	x	—	x	x
—	x	x	—	<i>Porana racemosa</i> . . . .	—	x	x	—
—	—	x	x	<i>Solanum barbisetum</i> VAR. <i>Griffithii</i> .	x	—	—	—
—	—	—	—	<i>Solanum biflorum</i> . . . .	x	x	x	x
—	—	—	—	<i>Solanum ferox</i> VAR. <i>inermis</i> . . . .	—	—	—	—
x	x	x	—	<i>Nicotiana Tabacum</i> . . . .	x	x	x	x
x	x	x	—	<i>Torenia edentula</i> . . . .	—	x	x	x
—	—	x	—	<i>Torenia flava</i> . . . .	—	x	x	x
—	x	x	x	<i>Torenia rubens</i> . . . .	—	—	—	—
—	x	x	—	<i>Torenia vagans</i> . . . .	—	x	—	—
x	x	x	—	<i>Vandellia scabra</i> . . . .	—	x	x	x
x	x	x	—	<i>Vandellia sessiliflora</i> . . . .	—	—	x	—
x	x	x	—	<i>Bonnaya reptans</i> . . . .	x	x	x	x
x	x	x	—	<i>Bonnaya veronicaefolia</i> . . . .	x	x	x	x
x	x	x	—	<i>Centranthera hispida</i> . . . .	—	x	x	x
x	x	x	—	<i>Aeginetia indica</i> . . . .	—	x	x	x
x	x	x	—	<i>Utricularia orbiculata</i> . . . .	—	x	x	x
—	—	—	—	<i>Æschynanthus grandiflora</i> VAR. <i>longiflora</i> .	—	—	—	—
—	—	x	—	<i>Æschynanthus brevipes</i> . . . .	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	—	—	<i>Æschynanthus maculata</i>	—	—	—	—
—	—	—	—	<i>Æschynanthus micrantha</i> VAR. <i>Pottingeri</i> .	—	—	—	—
—	—	—	—	<i>Æschynanthus pusilla</i> . . .	—	—	—	—
—	—	x	—	<i>Æschynanthus superba</i> . . .	—	—	—	—
—	x	x	—	<i>Rhynchotechum ellipticum</i> . .	—	—	—	—
—	—	x	—	<i>Rhynchotechum ellipticum</i> VAR. <i>angusta</i> .	—	—	x	—
—	x	x	—	<i>Rhynchotechum vestitum</i> . .	—	—	—	—
x	x	x	—	<i>Rhynchoglossum obliquum</i> VAR. <i>parviflora</i> .	—	x	x	x
—	—	—	—	<i>Staurothera grandiflora</i> . . .	—	—	x	x
—	—	—	—	<i>Didymocarpus elatior</i> . . .	—	—	—	—
—	x	x	—	<i>Chirita pumila</i> . . . .	—	—	—	—
—	—	—	—	<i>Chirita speciosa</i> . . . .	x	—	—	—
—	—	x	—	<i>Mayodendron igneum</i> . . .	x	—	x	—
x	x	x	—	<i>Sesamum indicum</i> . . . .	x	x	x	x
—	x	x	—	<i>Thunbergia coccinea</i> . . .	—	—	x	—
—	x	—	—	<i>Thunbergia lutea</i> . . . .	—	—	—	—
—	x	x	—	<i>Thunbergia grandiflora</i> . . .	x	x	—	—
x	x	x	—	<i>Nelsonia campestris</i> . . . .	x	—	x	x
—	—	x	—	<i>Hygrophila salicifolia</i> . . .	—	x	x	x
—	—	—	—	<i>Dædalacanthus tetragonus</i> . .	x	—	x	—
—	x	x	—	<i>Strobilanthes capitatus</i> . . .	—	—	x	—
—	x	x	—	<i>Strobilanthes coloratus</i> . . .	—	—	—	—
—	x	x	—	<i>Strobilanthes pentstemonoides</i> .	x	x	x	—
—	—	x	x	<i>Acanthus leucostachyus</i> . . .	x	—	—	—
—	—	x	—	<i>Asystasia Neesiana</i> . . . .	—	—	x	—
—	x	x	—	<i>Eranthemum indicum</i> . . . .	—	—	?	—
—	—	x	—	<i>Eranthemum palatiferum</i> . . .	x	x	x	—
—	—	—	—	<i>Eranthemum palatiferum</i> VAR. <i>elata</i>	—	—	x	—

India.	Himalaya.	Arracan-Assam.	Hokung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	x	—	<i>Codonacanthus pauciflorus</i> . . .	—	x	—	—
—	—	x	—	<i>Andrographis tenuiflora</i> . . .	—	—	x	—
—	—	x	—	<i>Phlogacanthus curviflorus</i> . . .	—	—	x	—
—	—	x	—	<i>Phlogacanthus Jenkinsii</i> . . .	x	—	—	—
—	x	x	—	<i>Phlogacanthus pubinervius</i> . . .	—	—	x	—
—	x	x	—	<i>Phlogacanthus tubiflorus</i> . . .	—	—	—	—
x	x	x	—	<i>Lepidagathis hyalina</i> . . .	—	x	x	—
x	x	x	—	<i>Justicia procumbens</i> VAR. <i>latispica</i> . . .	—	x	x	x
x	x	x	—	<i>Adhatoda Vasica</i> . . . . .	x	x	x	x
—	—	—	—	<i>Rhinacanthus calcaratus</i> VAR. <i>maxima</i> . . .	—	—	—	—
—	—	x	—	<i>Rungia stolonifera</i> . . . . .	—	—	—	—
x	x	x	—	<i>Dicliptera Roxburghiana</i> . . . . .	—	—	x	—
—	x	x	—	<i>Callicarpa arborea</i> . . . . .	x	—	x	x
—	x	x	—	<i>Caryopteris paniculata</i> . . . . .	x	—	—	—
x	x	x	—	<i>Premna herbacea</i> . . . . .	x	—	x	—
—	—	x	—	<i>Premna milleflora</i> . . . . .	—	—	—	—
x	x	x	—	<i>Gmelina arborea</i> . . . . .	—	—	x	x
—	—	x	—	<i>Vitex glabrata</i> . . . . .	—	—	x	x
—	x	x	—	<i>Clerodendron Colebrookeanum</i> . . . . .	x	—	x	x
—	—	—	x	<i>Clerodendron Griffithianum</i> . . . . .	x	—	—	—
x	x	x	—	<i>Clerodendron infortunatum</i> . . . . .	x	—	x	x
—	—	x	—	<i>Clerodendron lasiocephalum</i> . . . . .	x	—	—	—
—	x	x	—	<i>Clerodendron nutans</i> . . . . .	x	—	—	—
x	x	x	—	<i>Clerodendron serratum</i> . . . . .	x	—	x	—
—	—	x	—	<i>Sphenodesma pentandrum</i> . . . . .	—	x	x	x
—	—	x	—	<i>Congea tomentosa</i> . . . . .	—	—	x	—
—	x	x	—	<i>Geniosporum strobiliferum</i> . . . . .	—	—	x	—
x	x	x	—	<i>Acrocephalus capitatus</i> . . . . .	—	—	x	x
x	—	x	—	<i>Orthosiphon stamineus</i> . . . . .	x	x	x	x
—	x	x	—	<i>Plectranthus Coetsa</i> . . . . .	—	—	x	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	x	—	<i>Plectranthus hispidus</i> . . .	—	x	x	—
x	x	x	—	<i>Plectranthus ternifolius</i> . . .	x	x	x	—
x	x	x	—	<i>Dysophylla Auricularia</i> . . .	—	x	x	x
x	x	x	—	<i>Colebrookia oppositifolia</i> . . .	x	—	x	—
—	x	x	—	<i>Perilla ocimoides</i> . . .	—	x	x	—
.	—	x	x	<i>Scutellaria glandulosa</i> . . .	—	—	x	—
—	x	x	—	<i>Achyropermum Wallichianum</i> . . .	—	—	x	—
—	x	x	—	<i>Notochæte hamosa</i> . . .	—	—	—	—
—	x	—	—	<i>Leucas hyssopifolia</i> . . .	—	—	x	—
x	x	x	—	<i>Leucas mollissima</i> . . .	—	x	x	—
—	—	x	—	<i>Gomphostemma lucidum</i> . . .	x	—	—	—
—	—	x	—	<i>Gomphostemma nutans</i> . . .	—	—	—	—
—	—	x	—	<i>Gomphostemma parviflorum</i> VAR. <i>farinosa</i> . . .	—	—	—	—
—	x	x	—	<i>Leucoscepttrum canum</i> . . .	y	—	—	—
—	x	x	—	<i>Teucrium stoloniferum</i> . . .	x	x	x	—
x	x	x	—	<i>Ajuga macrosperma</i> VAR. <i>breviflora</i> . . .	—	—	—	—
x	x	x	—	<i>Plantago major</i> . . .	x	x	x	x
x	x	x	—	<i>Deeringia celosioides</i> . . .	x	x	x	x
x	x	x	—	<i>Amarantus paniculatus</i> . . .	—	x	x	x
x	x	x	—	<i>Aerua scandens</i> . . .	x	x	x	x
x	x	x	—	<i>Gomphrena globosa</i> . . .	x	x	x	x
x	x	x	—	<i>Polygonum alatum</i> . . .	x	x	x	—
x	x	x	—	<i>Polygonum chinense</i> . . .	x	x	x	x
—	x	x	—	<i>Polygonum runcinatum</i> . . .	—	x	—	x
—	x	x	—	<i>Polygonum viscosum</i> . . .	—	x	—	—
—	x	x	—	<i>Fagopyrum cymosum</i> . . .	x	x	—	—
—	x	x	—	<i>Piper boehmeriæfolium</i> . . .	—	—	x	—
—	—	—	—	<i>Piper Kingianum</i> . . .	x	—	—	—
x	—	x	—	<i>Chloranthus brachystachyus</i> . . .	—	x	x	x
—	x	x	—	<i>Actinodaphne sikkimensis</i> . . .	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hokung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	—	<i>Phœbe attenuata</i> . . . .	—	—	—	—
x	—	—	—	<i>Phœbe paniculata</i> . . . .	—	—	x	—
x	x	x	—	<i>Litsæa polyantha</i> . . . .	—	x	x	x
—	x	x	—	<i>Litsæa salicifolia</i> VAR. <i>ellipsoidea</i> .	—	—	—	—
x	x	x	—	<i>Litsæa sebifera</i> . . . .	—	x	x	x
—	—	x	—	<i>Lindera assamica</i> . . . .	x	—	—	—
—	—	—	—	<i>Daphne pendula</i> . . . .	—	—	x	x
—	x	x	x	<i>Wikstroemia canescens</i> . . . .	—	x	x	—
—	x	x	—	<i>Loranthus involucratu</i> s . . . .	—	—	—	—
—	x	x	—	<i>Loranthus pentapetalu</i> s . . . .	x	x	x	x
—	—	—	—	<i>Briedelia pubescens</i> VAR. <i>glabra</i> .	x	—	—	—
x	x	x	—	<i>Sauropus albicans</i> . . . .	—	x	x	x
—	x	x	x	<i>Glochidion assamicum</i> . . . .	—	—	—	—
—	—	—	x	<i>Glochidion villicaule</i> . . . .	—	—	—	x
x	x	x	—	<i>Flueggea microcarpa</i> . . . .	—	x	x	x
—	—	x	—	<i>Aporosa oblonga</i> . . . .	—	—	x	—
—	x	x	—	<i>Aporosa Roxburghii</i> . . . .	—	—	x	—
—	x	x	—	<i>Daphniphyllum himalayense</i> . . . .	—	—	x	—
x	x	x	x	<i>Antidesma Ghæsembhilla</i> . . . .	—	x	x	x
x	—	x	—	<i>Croton oblongifolius</i> . . . .	x	—	x	—
—	—	—	—	<i>Acalypha</i> sp. . . . .	—	—	—	—
—	x	x	—	<i>Mallotus albus</i> . . . .	—	—	—	—
—	x	x	—	<i>Mallotus nepalensis</i> . . . .	—	—	—	—
—	x	x	—	<i>Macaranga denticulata</i> . . . .	—	—	x	x
x	x	x	—	<i>Homonoia riparia</i> . . . .	x	x	x	x
—	—	—	—	<i>Baliospermum micranthum</i> . . . .	—	—	—	—
x	x	x	—	<i>Ricinus communis</i> . . . .	x	x	x	x
x	x	x	—	<i>Gelonium multiflorum</i> . . . .	x	x	x	x
x	x	x	x	<i>Girroniera reticulata</i> . . . .	—	x	x	x
x	x	x	—	<i>Cannabis sativa</i> . . . .	x	x	x	✓

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
x	—	—	x	<i>Streblus asper</i> . . . . .	x	x	x	x
—	x	x	—	<i>Ficus clavata</i> . . . . .	x	—	x	x
—	—	x	—	<i>Ficus clavata</i> VAR. <i>trachycarpa</i> . . . . .	—	—	—	—
—	x	x	—	<i>Ficus hirta</i> . . . . .	—	x	x	x
—	x	x	—	<i>Ficus hirta</i> VAR. <i>Roxburghii</i> . . . . .	—	x	x	x
—	x	x	—	<i>Ficus mysorensis</i> VAR. <i>subrepanda</i> . . . . .	—	—	x	—
—	x	x	—	<i>Ficus obscura</i> . . . . .	—	—	x	x
—	x	x	—	<i>Ficus obtusifolia</i> . . . . .	x	—	x	x
—	—	x	x	<i>Cudrania fruticosa</i> . . . . .	—	—	x	—
—	x	x	—	<i>Conocephalus suaveolens</i> . . . . .	x	—	x	x
—	x	x	—	<i>Pilea bracteosa</i> . . . . .	—	—	—	—
—	x	x	—	<i>Boehmeria macrophylla</i> . . . . .	x	—	—	—
x	x	x	—	<i>Boehmeria platyphylla</i> . . . . .	—	x	x	x
—	—	x	—	<i>Boehmeria platyphylla</i> VAR. <i>scabrella</i> . . . . .	—	—	—	—
x	x	x	—	<i>Elatostema papillosum</i> . . . . .	—	—	—	—
x	x	x	—	<i>Elatostema platyphyllum</i> . . . . .	—	—	—	—
—	—	x	—	<i>Elatostema rupestre</i> . . . . .	—	—	x	x
—	—	x	—	<i>Maoutia Puya</i> . . . . .	x	—	x	x
—	x	x	—	<i>Engelhardtia spicata</i> . . . . .	x	—	x	x
—	x	x	—	<i>Castanopsis tribuloides</i> . . . . .	—	—	x	—
—	x	x	—	<i>Alnus nepalensis</i> . . . . .	x	—	—	—
—	x	x	—	<i>Betula alnoides</i> . . . . .	—	—	x	—
x	x	x	—	<i>Salix tetrasperma</i> . . . . .	—	—	x	x
—	—	x	—	<i>Gnetum Gnemon</i> . . . . .	—	—	—	x
—	—	x	—	<i>Microstylis baurita</i> . . . . .	—	—	—	—
x	x	x	—	<i>Oberonia iridifolia</i> . . . . .	—	—	x	—
x	x	x	x	<i>Liparis longipes</i> . . . . .	—	x	x	x
—	—	x	—	<i>Dendrobium cariniferum</i> . . . . .	x	—	x	—
—	x	x	—	<i>Dendrobium chrysanthemum</i> . . . . .	—	—	x	—
—	x	x	—	<i>Dendrobium cretaceum</i> . . . . .	—	—	x	—
—	x	x	—	<i>Dendrobium Falconeri</i> . . . . .	—	—	x	—

India.	Himalaya.	Arracan-A. sam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China	Malaya.
-	-	x	-	<i>Dendrobium lituiflorum</i> . . .	-	-	x	-
-	x	x	-	<i>Dendrobium nobile</i> . . .	-	x	-	-
-	x	x	-	<i>Dendrobium Pierardi</i> . . .	-	-	x	-
-	x	x	-	<i>Dendrobium transparens</i> . . .	-	-	-	-
-	-	x	-	<i>Dendrobium Wardianum</i> . . .	-	-	x	-
-	-	-	-	<i>Dendrobium papilliferum</i> . . .	-	-	-	-
-	x	x	-	<i>Bulbophyllum Careyianum</i> . . .	-	-	x	-
-	x	x	-	<i>Bulbophyllum leopardinum</i> . . .	-	-	-	-
-	x	x	-	<i>Bulbophyllum reptans</i> . . .	-	-	-	-
-	-	-	-	<i>Bulbophyllum suavissimum</i> . . .	-	-	x	-
-	-	-	-	<i>Bulbophyllum fimbriatigerum</i> . . .	-	-	-	-
-	-	-	-	<i>Ione kachinensis</i> . . .	-	-	-	-
-	x	x	-	<i>Cirrhopetalum maculosum</i> . . .	-	-	-	-
-	x	-	-	<i>Cirrhopetalum retractum</i> . . .	-	-	x	x
-	x	x	-	<i>Eria paniculata</i> . . .	-	-	-	-
-	-	x	-	<i>Eria clavicaulis</i> . . .	-	-	-	-
-	x	x	-	<i>Eria pannea</i> . . .	-	-	x	x
-	x	x	-	<i>Eria stricta</i> . . .	-	-	x	-
x	x	x	-	<i>Pachystoma senile</i> . . .	-	x	x	x
-	-	x	-	<i>Spathoglottis pubescens</i> . . .	x	x	x	-
x	x	x	-	<i>Phajus albus</i> . . .	-	-	x	-
-	-	-	-	<i>Nephelaphyllum sp.</i> . . .	-	-	-	-
-	-	x	-	<i>Tainia viridifusca</i> . . .	-	-	x	-
-	x	x	-	<i>Anthogonium gracile</i> . . .	-	-	x	-
-	x	x	-	<i>Agrostophyllum khasianum</i> . . .	-	-	x	-
-	x	x	-	<i>Coelogyne Gardneriana</i> . . .	-	-	x	-
-	-	x	-	<i>Coelogyne graminifolia</i> . . .	x	-	x	-
-	-	-	-	<i>Coelogyne (near C. ochracea)</i> . . .	-	-	-	-
-	x	x	-	<i>Otochilus fusca</i> . . .	-	-	-	-
x	x	x	-	<i>Pholidota imbricata</i> . . .	-	-	x	-

India.	Himalaya.	Arracca-Assam.	Hukong Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
-	x	x	x	<i>Pholidota rubra</i> . . . .	-	-	-	-
-	-	x	-	<i>Calanthe angusta</i> . . . .	-	-	-	-
-	x	-	-	<i>Calanthe brevicornu</i> . . . .	-	-	-	-
-	x	x	-	<i>Calanthe densiflora</i> . . . .	-	-	-	-
x	x	x	-	<i>Arundina bambusifolia</i> . . . .	-	-	x	x
-	-	-	-	<i>Eulophia longibracteata</i> . . . .	-	-	-	-
x	x	x	-	<i>Eulophia nuda</i> . . . .	-	-	x	-
-	-	-	-	<i>Cymbidium eburneum</i> VAR. . . .	-	-	?	-
x	x	x	-	<i>Geodorum dilatatum</i> . . . .	-	-	x	-
x	x	x	-	<i>Rhyncostylis retusa</i> . . . .	-	-	x	x
-	-	-	-	<i>Stereochilus kachinensis</i> . . . .	-	-	-	-
-	x	x	-	<i>Aerides Fieldingii</i> . . . .	-	-	-	-
-	x	x	-	<i>Aerides multiflorum</i> . . . .	-	-	x	-
-	-	-	-	<i>Vanda Bensoni</i> . . . .	-	-	x	-
-	x	x	-	<i>Vanda teres</i> . . . .	-	-	x	x
-	x	x	-	<i>Saccolabium gemmatum</i> . . . .	-	-	-	-
x	x	x	-	<i>Saccolabium papillosum</i> . . . .	-	-	x	-
-	-	-	-	<i>Saccolabium obliquum</i> ? . . . .	-	-	?	-
-	-	-	-	<i>Saccolabium Cruddasianum</i> . . . .	-	-	-	-
-	x	x	-	<i>Sarcanthus filiformis</i> . . . .	-	-	x	-
-	x	x	-	<i>Sarcanthus pallidus</i> . . . .	-	-	x	-
-	x	x	-	<i>Ornithochilus fuscus</i> . . . .	-	x	x	-
-	-	x	-	<i>Vanilla</i> . . . .	-	-	-	-
-	x	x	-	<i>Tropidia curculigoides</i> . . . .	-	-	x	-
x	x	x	-	<i>Goodyera procera</i> . . . .	-	x	x	?
x	-	-	-	<i>Pogonia carinata</i> . . . .	-	-	x	x
x	-	-	-	<i>Pogonia juliana</i> . . . .	-	-	-	-
x	x	x	-	<i>Epipogum nutans</i> . . . .	-	-	-	-
-	x	x	-	<i>Habenaria constricta</i> . . . .	-	-	x	x
-	-	-	-	<i>Habenaria Cruddasiana</i> . . . .	-	-	-	-
x	x	-	-	<i>Habenaria Galeandra</i> . . . .	-	x	x	-

India.	Himalaya.	Arracan-Assam.	Hokung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	x	x	—	<i>Habenaria geniculata</i> . . .	—	—	x	—
—	—	x	—	<i>Habenaria Helferi</i> . . .	—	—	x	—
—	—	x	—	<i>Habenaria furfuracea</i> . . .	—	—	—	—
—	x	x	—	<i>Habenaria Parishii</i> . . .	—	—	x	—
x	x	x	—	<i>Habenaria Susannæ</i> . . .	—	x	x	x
—	—	—	—	<i>Habenaria Pottingeriana</i> . . .	—	—	—	—
—	—	—	—	<i>Habenaria trichosanthes</i> . . .	x	—	x	—
x	x	x	—	<i>Apostasia Wallichii</i> . . .	—	—	x	—
—	x	x	—	<i>Globba multiflora</i> . . .	—	—	—	—
—	—	—	—	<i>Globba sessiliflora</i> . . .	—	—	x	—
—	x	x	—	<i>Hemiorchis Pantlingii</i> . . .	—	—	—	—
x	—	—	—	<i>Curcuma aromatica</i> . . .	—	—	x	—
—	—	—	—	<i>Curcuma plicata</i> . . .	x	—	x	—
—	—	—	—	<i>Curcuma Roscoeana</i> . . .	—	—	x	—
—	x	x	—	<i>Gastrochilus longiflora</i> . . .	—	—	x	x
—	—	—	—	<i>Gastrochilus pulcherrima</i> . . .	—	—	x	x
x	—	—	—	<i>Kæmpferia Galanga</i> . . .	—	—	x	x
—	—	—	—	<i>Kæmpferia marginata</i> . . .	—	—	x	—
—	x	x	—	<i>Hedychium coccineum</i> . . .	x	—	—	—
x	x	x	—	<i>Hedychium coronarium</i> . . .	x	—	x	x
—	—	x	—	<i>Hedychium luteum</i> . . .	—	—	—	—
—	x	x	—	<i>Zingiber capitatum</i> VAR. <i>elata</i> . . .	—	—	—	—
—	x	x	—	<i>Zingiber chrysanthum</i> . . .	—	—	—	—
x	x	x	—	<i>Zingiber Zerumbet</i> . . .	—	x	x	x
x	x	x	—	<i>Alpina Galanga</i> . . .	—	—	x	x
—	—	—	—	<i>Ophiopogon cordylinoides</i> . . .	—	—	—	—
—	x	x	—	<i>Ophiopogon Wallichianum</i> . . .	x	—	x	—
x	x	x	—	<i>Hypoxis aurea</i> . . .	—	x	x	x
x	x	x	—	<i>Tacca laevis</i> . . .	—	—	x	x
x	x	x	—	<i>Dioscorea daemona</i> . . .	—	—	x	x

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
x	x	x	—	<i>Dioscorea oppositifolia</i> . . .	—	—	—	—
—	x	x	—	<i>Smilax ferox</i> . . . .	—	—	x	—
—	x	x	—	<i>Smilax lanceæfolia</i> . . . .	—	x	x	—
x	x	x	—	<i>Smilax Roxburghiana</i> . . . .	—	—	—	—
x	x	x	—	<i>Smilax macrophylla</i> . . . .	—	—	x	—
—	x	x	—	<i>Tupistra aurantiaca</i> . . . .	—	—	—	—
—	x	x	—	<i>Dracæna ensifolia</i> . . . .	—	—	x	—
—	—	x	—	<i>Dracæna spicata</i> . . . .	—	—	—	—
—	—	—	—	<i>Disporum oblanceolatum</i> . . . .	—	—	—	—
—	x	x	—	<i>Paris polyphylla</i> . . . .	x	x	x	—
—	x	x	—	<i>Polygonatum cirrhifolium</i> . . . .	—	x	—	—
—	x	—	—	<i>Polygonatum nervulosum</i> . . . .	—	—	—	—
x	x	x	—	<i>Monochoria vaginalis</i> . . . .	—	x	x	x
—	x	x	—	<i>Polia Aclisia</i> . . . .	—	—	x	x
x	x	x	—	<i>Commelina bengalensis</i> . . . .	—	x	x	x
x	x	x	—	<i>Commelina obliqua</i> . . . .	—	—	x	x
x	—	x	—	<i>Commelina salicifolia</i> . . . .	x	x	x	x
x	x	x	—	<i>Aneilema lineolatum</i> . . . .	—	—	x	x
x	x	x	—	<i>Aneilema scaberrimum</i> . . . .	—	—	x	x
—	—	x	—	<i>Aneilema triquetrum</i> . . . .	—	x	—	—
—	x	x	x	<i>Streptolirion volubile</i> . . . .	—	x	—	—
—	—	—	—	<i>Streptolirion volubile</i> VAR. <i>setosa</i> . . . .	—	—	—	—
x	x	x	—	<i>Floscopa scandens</i> . . . .	—	x	x	x
—	x	x	—	<i>Pinanga gracilis</i> . . . .	—	—	x	—
—	x	—	—	<i>Wallichia disticha</i> . . . .	—	—	x	—
—	—	x	—	<i>Phoenix humilis</i> VAR. <i>Loureirii</i> . . . .	—	—	x	—
—	—	?	—	<i>Plectocomia assamica</i> ? . . . .	—	—	—	—
—	—	x	—	<i>Arisæma album</i> . . . .	—	—	—	—
—	x	—	—	<i>Arisæma concinnum</i> . . . .	—	—	—	—
—	—	x	—	<i>Arisæma petiolulatum</i> . . . .	—	—	—	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
—	—	✓	—	<i>Typhonium cuspidatum</i> . . .	—	—	x	x
x	—	x	—	<i>Typhonium gracile</i> . . .	—	—	—	—
—	—	x	—	<i>Typhonium inopinatum</i> . . .	—	—	—	—
—	—	—	—	<i>Typhonium Pottingeri</i> . . .	—	—	—	—
—	—	—	—	<i>Amorphophallus Cruddasianus</i> .	—	—	—	—
—	—	—	—	<i>Amorphophallus</i> sp. . . .	—	—	—	—
—	x	x	—	<i>Gonatanthus sarmentosus</i> . . .	—	—	—	—
✓	x	x	—	<i>Colocasia antiquorum</i> . . .	—	x	x	x
✓	x	x	—	<i>Alocasia indica</i> . . . .	—	x	✓	x
—	—	—	—	<i>Stendnera capitellata</i> . . .	x	—	x	—
x	x	x	—	<i>Lasia aculeata</i> . . . .	—	x	x	x
—	x	x	—	<i>Pothos Cathcartii</i> . . . .	x	—	x	—
x	x	x	—	<i>Pothos scandens</i> . . . .	x	x	x	x
—	x	x	—	<i>Pothos Vriesianus</i> . . . .	—	—	—	—
x	x	x	—	<i>Sagittaria sagittifolia</i> . . .	—	x	x	—
x	—	x	—	<i>Aponogeton crispus</i> . . . .	—	—	x	—
x	—	x	—	<i>Potamogeton perpusillus</i> . .	—	x	x	—
x	x	x	—	<i>Lipocarpa argentea</i> . . . .	—	?	x	x
x	x	✓	—	<i>Bulbostytis capillaris</i> VAR <i>trifida</i> .	—	x	x	x
x	x	✓	—	<i>Carex baccans</i> . . . .	—	x	—	x
—	x	x	—	<i>Carex cruciata</i> . . . .	—	—	—	—
x	—	x	—	<i>Carex filicina</i> . . . .	—	x	—	x
—	x	x	—	<i>Carex spiculata</i> . . . .	—	—	—	—
x	x	x	—	<i>Carex stramentitia</i> . . . .	—	—	—	—
x	—	x	x	<i>Carex Thomsoni</i> . . . .	—	—	x	—
—	x	✓	—	<i>Setaria italica</i> . . . .	x	x	x	x
x	x	x	—	<i>Coix Lachryma</i> . . . .	—	x	x	x
x	x	—	—	<i>Anthistiria scandens</i> . . . .	—	—	x	x
—	—	—	—	<i>Dendrocalamus Brandisii</i> . .	—	—	x	—
—	x	x	—	<i>Pseudostachyum polymorphum</i> .	—	—	x	—

India.	Himalaya.	Arracan-Assam.	Hukung Valley.	Name of Species.	Taping Valley.	China.	E. Indo-China.	Malaya.
-	x	-	-	<i>Cephalostachyum Fuchsianum</i>	-	-	-	-
x	x	x	-	<i>Equisetum debile</i>	-	x	x	x
-	x	x	-	<i>Equisetum diffusum</i>	x	-	-	-
x	x	x	-	<i>Lycopodium cernuum</i>	-	x	x	x
-	x	x	-	<i>Selaginella canaliculata</i>	-	x	x	x
-	x	x	-	<i>Selaginella picta</i>	-	-	-	-
-	x	x	-	<i>Selaginella Wallichii</i>	-	-	x	x
x	x	x	-	<i>Davallia chinensis</i>	-	x	x	x
-	-	x	-	<i>Davallia Griffithiana</i>	x	x	x	x
-	x	x	-	<i>Onychium auratum</i>	x	x	x	x
x	x	x	-	<i>Pteris biaurita</i>	-	x	x	x
-	x	x	-	<i>Blechnum orientale</i>	-	x	x	x
-	x	x	-	<i>Asplenium Finlaysonianum</i>	-	-	x	x
x	x	x	-	<i>Asplenium planicaule</i>	-	-	-	-
x	x	x	-	<i>Aspidium aristatum</i>	-	x	x	-
x	x	x	-	<i>Nephrodium falcilobum</i>	-	x	x	x
-	x	x	-	<i>Nephrodium Leuzeanum</i>	x	x	x	x
x	x	x	-	<i>Nephrodium membranifolium</i>	-	-	x	x
x	x	x	-	<i>Nephrodium varicosum</i>	-	-	x	x
-	x	x	-	<i>Polypodium leiobhizon</i>	-	-	-	-
-	-	x	-	<i>Platyserium Wallichii</i>	-	-	-	x
x	x	x	-	<i>Gymnogramme javanica</i>	-	x	x	x
x	x	x	-	<i>Antrophyum plantagineum</i>	-	-	x	x
x	x	x	-	<i>Acostichum appendiculatum</i>	x	x	x	x
x	x	x	-	<i>Lygodium pinnatifidum</i>	x	x	x	x
x	x	x	-	<i>Helminthostachys zeylanica</i>	-	x	x	x
x	x	x	-	<i>Ophioglossum vulgatum</i>	-	x	x	x

## Synopsis of Distribution of Kachin Species.

Kachin Hill plants sent to Herbarium Calcutta, during the year 1897 . . . . . 627

Endemic in the Catchment-area of Upper Irrawaddy (Hukung-Kachin-Taping) . . . . . 53

Occurring elsewhere than in the Kachin-Taping area . . . . . 574

Distributed Westward only . . . . . 135

India	Assam	—	—	—	—	3
India	Himalaya	Assam	—	—	—	8
India	Himalaya	Assam	—	—	—	11
—	Himalaya	Assam	—	—	—	45
—	Himalaya	Assam	—	—	—	67

Distributed both Westward and Eastward from the Kachin Hills . . . . . 408

With Western influences predominating . . . . . 173

India	Assam	—	Malaya	—	—	1
India	Himalaya	Assam	Shan	—	—	1
India	Himalaya	Assam	—	—	China	1
India	Himalaya	Assam	—	Malaya	China	1
—	Himalaya	Assam	—	Malaya	—	2
India	Himalaya	Assam	—	Malaya	—	3
India	Assam	Shan	—	—	—	6
—	Himalaya	Assam	—	—	China	11
India	Himalaya	Assam	Shan	—	China	12
India	Himalaya	Assam	Shan	—	—	27
India	Himalaya	Assam	Shan	Malaya	—	36
—	Himalaya	Assam	Shan	—	—	72

With Western influences counterbalanced by Eastern . . . . . 184

India	Himalaya	Assam	Shan	Malaya	China	100
—	Himalaya	Assam	Shan	Malaya	—	24
—	—	Assam	Shan	—	—	24
—	Himalaya	Assam	Shan	—	China	14
—	—	Assam	—	—	China	5
India	—	—	Shan	—	China	3
India	—	Assam	Shan	Malaya	—	2
—	Himalaya	—	Shan	—	—	3
—	—	Assam	—	Malaya	—	2
India	Himalaya	—	—	Malaya	China	1
India	—	Assam	—	Malaya	China	1
—	Himalaya	Assam	—	Malaya	China	1
India	Himalaya	Assam	Shan	—	China	1
—	Himalaya	—	—	—	China	1
India	—	—	—	Malaya	—	1
India	—	—	—	—	China	1

With Eastern influences predominating . . . . . 51

—	Himalaya	Assam	Shan	Malaya	China	10
—	—	Assam	Shan	Malaya	China	10
—	—	Assam	Shan	Malaya	—	9
India	—	Assam	Shan	Malaya	China	5
—	—	Assam	Shan	—	China	5
—	—	Assam	—	Malaya	China	1
India	—	—	Shan	Malaya	—	1
—	Himalaya	—	Shan	Malaya	—	1

Distributed Eastward only . . . . . 31

—	—	—	Shan	—	—	31
—	—	—	Shan	Malaya	—	4
—	—	—	—	—	China	3
—	—	—	Shan	Malaya	China	2
—	—	—	—	Malaya	—	1

TOTALS,	318	416	522	402	228	105	
... .. INDIA.	HIMALAYA.	ASSAM.	SHAN.	MALAYA.	CHINA.	[ENDEMIC,	8°45' N.]
Per cent.	34° 70	66° 34	83° 25	64° 11	36° 35	31° 10	

There is a very appreciable endemic element in the Kachin Flora; the collections of the first year of exploration contain 53 apparently endemic forms out of a total of 627, making about one-twelfth, or 8.45 per cent., of the whole. Of the remaining eleven-twelfths, 31 species, making only 4.94 %, or about one-nineteenth part of the whole flora, are purely eastern in distribution; occurring, that is to say, in China, in the Indo-Chinese area east of the Irrawaddy, or in Malaya, without extending westward and southward along the Assam-Arracan ranges. Of these 31 plants, as many as 21 extend only, so far as is known, to the Shan Plateau. Nor do those plants that, while they extend both eastward and westward from the Kachin country are more widely spread to the east than they are to the west of these hills, bulk very largely; of such, the list contains but 51, again about one-twelfth or 8.13 per cent., of the whole flora. Even if we add these to the purely eastern species, we only obtain a total of 82, making 13.07 per cent., or something like one-eighth of the whole flora, wherein eastern influences may be said to predominate.

The western and eastern influences are counterbalanced in 184 species, or nearly one-third (29.34 per cent.) of the flora as represented by our list; of these as many as 100, or 15.78 per cent., (one-sixth of the flora) occur in every part of south-eastern Asia, the majority being cosmopolitan tropical or sub-tropical plants.

The element wherein western influences predominate much exceeds that which indicates eastern affinities, and, indeed, considerably exceeds that where the two influences are balanced. There are 135 species, nearly one-fifth (more exactly 21.53 per cent.) of the flora that extend westward only, while as many as 173, about one-fourth (more exactly 27.59 per cent.) of the whole, are more widespread to the west than to the east of the Kachin country. If these two groups of species be added, we have a total of 308, nearly one-half (more exactly 47.54 per cent.) of the flora wherein western influences predominate. The total number of species that occur in Assam, the Himalayas, or India, is 543, as against 439 that occur in China, Eastern Indo-China, or Malaya.

When the distribution in particular sub-sub-areas is considered we find that more light is thrown on the precise affinities of the Kachin flora. Though Kachin is situated close to China, its flora is obviously not very closely allied to the Chinese flora. Only 195 Kachin species, 31.10 per cent., or rather less than a third of the flora, occur in China at all, and there are, in the whole list, but three species, *Wistaria chinensis*, *Rhododendron indicum* and *Rauwolfia*

*chinensis*, that are *peculiarly* Chinese. The meagreness of the Chinese element is emphasised by the fact that in Malaya, with the whole of Indo-China intervening, and in India with Assam intervening, we find respectively 228, or 36·36 per cent., and 218 or 34·76 per cent., of our Kachin Hill plants.

In Eastern Indo-China we find almost twice as many Kachin Hill plants as we do in China, the number and percentage being 402 and 64·11, respectively. The especially Indo-Chinese element is seven times as great, for there are twenty-one Kachin plants that occur, out of Kachin, only on the Shan Plateau or in Prome, Tonquin, and Siam. Still the number of Kachin Hill species in Eastern Indo-China is exceeded by the number that occur in the Eastern Himalaya, whither 416, or 66·34 per cent. of our plants extend. The peculiarly Himalayan element is, however, only about one-third the strength of the Shan element, for there are but eight Kachin species peculiar to the Himalaya, as against the twenty-one peculiar to the country east of the Irrawaddy. If, however, we think of the species that extend from the Kachin Hills, both to the Himalayas and to the Assam ranges, without occurring in Eastern Indo-China at all, we are able to realize how small the Shan element really is. There are as many as 67 species, 10·68 per cent., of the flora, that belong to this category, more than thrice the number that are peculiarly Indo-Chinese. The affinities of the Kachin flora are thus manifestly greatest with the floras that characterise the Himalayan and Assam-Arracan sub-sub-areas, particularly the latter, since 522 species, 83·25 per cent., or about five-sixths of the whole list occur in the Assam Ranges, and as many as 46, or 7·03 per cent., of these species are peculiarly Assamese. The Mishmi-Kachin block then, so far at least as the evidence derived from the present collection in its Eastern or Kachin section goes, must be treated as part of the Assam-Arracan sub-sub-area rather than as a part of the Chinese, the Indo-Chinese, or even the Himalayan regions.

The comparative value of the influences exerted by the four adjacent areas of China, the Eastern Himalaya, Indo-China east of the Irrawaddy Valley, and the Assam-Arracan ranges, are however more accurately determined by employing in succession the numbers indicated by each actual distributional arrangement that occurs. By treating the figures thus attained as numerators and by using as denominators the number of adjacent areas involved in each case, we obtain a series of fractions the sum of which gives us a number that indicates the proportional influence of each adjacent area in the

composition of the Kachin flora. It is unnecessary here to do more than indicate the results thus attained, which are as follows:—

Assam	230'3,	or	40'1	%
Himalaya	128'4,	or	22'4	%
Shan	154'9,	or	27	%
China	60'4,	or	10'5	%

(Distributed species)	574	100
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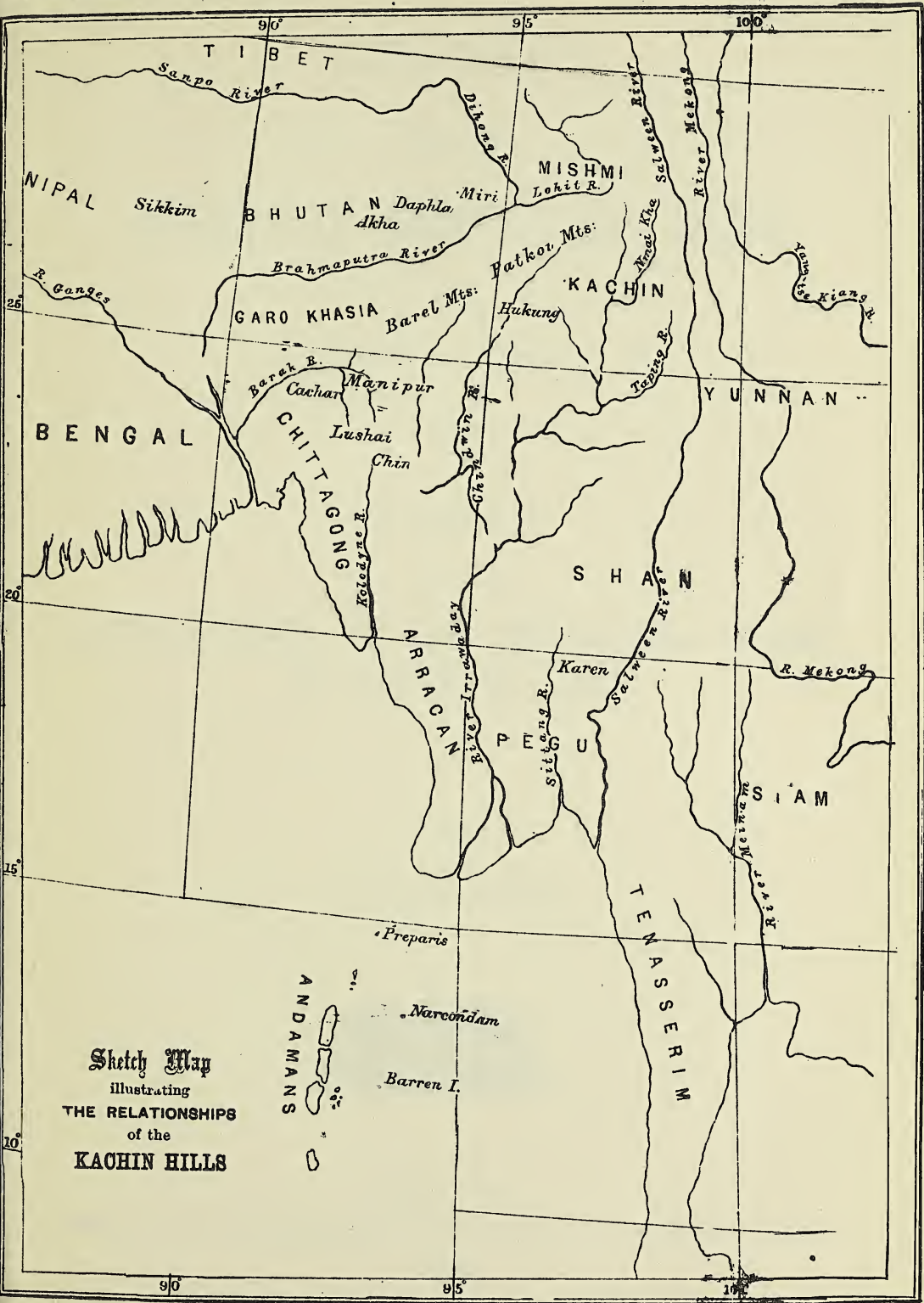
Here again the slightness of the affinity with the Chinese flora and the paramount influence of the Assam-Arracan flora, is very manifest.

A synoptic view of the systematic character of the collection is given in the following table:—

*Systematic Synopsis of Kachin Plants reported during 1897.*

Phanerogams . . . .	99	387	601
Dicotyledons . . . .	84	302	441
Polypetalæ . . . .	43	132	190
Thalamifloræ . . . .	15	39	48
Discifloræ . . . .	13	27	36
Calycifloræ . . . .	15	66	106
Gamopetalæ . . . .	28	124	183
Incompletæ . . . .	13	46	68
Monocotyledons . . . .	15	85	160
Cryptogams . . . .	4	18	26
TOTALS . . . .	NAT. ORDERS 103	Genera 405	Species 627

The most extensively represented natural order is *Orchidaceæ*, with 77 species, followed by *Leguminosæ* with 60 species; *Acanthaceæ*, 26; *Rubiaceæ*, 25; *Labiataæ*, *Urticaæ* and *Filices*, 20 each; *Euphorbiaceæ*, 18; *Compositæ*, *Scitamineæ* and *Aroidæ*, 17 each; *Verbenaceæ*, 14; *Gesneraceæ*, 13; *Liliacæ*, 11; and *Commelynaceæ*, 10. Of those natural orders with less than ten species, *Rosaceæ* has 9; *Rutaceæ*, *Asclepiadaceæ* and *Cyperaceæ* 8 each; *Malvaceæ*, *Apocynaceæ*, and *Laurineæ*, each 7; *Sterculiaceæ*, *Ternstroemiaceæ*, *Cucurbitaceæ* and *Gramineæ*, each 6. There are six natural orders with five representatives, seven with four species, thirteen with three species, nineteen with two species, the rest with but one species each.



Sketch Map  
illustrating  
THE RELATIONSHIPS  
of the  
KACHIN HILLS



RECORDS  
OF THE  
BOTANICAL SURVEY OF INDIA.

PUBLISHED BY AUTHORITY.

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VOLUME I

NO. 12.

CONTRIBUTIONS TO THE BRYOLOGICAL FLORA  
OF SOUTHERN INDIA.

BY

V. F. BROTHERUS.



CALCUTTA:  
OFFICE OF SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.  
1899.



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REPORT

ON A

COLLECTION OF MOSSES MADE BY Dr. T. L. WALKER  
IN COORG DURING THE COLD WEATHER OF  
1897-98.

---

Last summer Dr. *D. Prain*, Superintendent of the Botanical Garden of Calcutta, had the kindness to send me a rich and very interesting collection of mosses made by Dr. *T. L. Walker* in Coorg, asking me to determine them and also expressing a wish that I should make a list of all the species in the collection. In now publishing it, I do so the more readily that the Bryological Flora of South India is still very little known, and because Dr. *Walker's* collection is, moreover, excellent owing to its exact statements of the places where the different species grow.

*Helsingfors, January 1899.*

WEISIACEÆ.

ANOECTANGIUM (Hedw.) Br. eur.

*Anoectangium Walkeri* Broth. n. sp.

*Dioicum*; gracile, caespitosum, caespitibus densissimis, usque ad 3 cm. altis, inferne fusco-tomentosis, superne laete viridibus; *caulis* erectus, dense foliosus; *folia* sicca incurva, superiora spiraliter contorta, humida erecto-patentia, carinato-concava, lanceolata, mucronata, marginibus inferne plus minusve revolutis, integerrimis, nervo basi c. 0.05 mm. lato, in mucronem brevem, acutissimum excedente, dorso ubique scabro, cellulis rotundato quadratis, c. 0.007 mm., minute papillois, basilaribus infimis ad nervum anguste rectangularibus, laevibus. Caetera ignota.

Coorg: dry faces of cliffs of gneiss near Mercara (n. 277).

Species *A. claro* Mitt. similis, sed foliis superioribus spiraliter contortis, nervo dorso ubique scabro cellulisque papillois optime diversa.

## WEISIA Hedw.

*Weisia edentula* Mitt., Musc. Ind. or. p. 27.

Coorg: Mercara, dry granite rocks (n. 62); face of gneiss cliffs 8 miles east of Mercara (n. 9); face of granite cliff near Hatur (n. 196); on abandoned anthills in South Coorg (n. 211); dry clay banks near Murnad (n. 103).

## DICRANACEÆ.

## TREMATODON Michx.

*Trematodon paucifolius* C. Müll.—Mitt., Musc. Ind. or. p. 13.

Coorg: Sidapur, perpendicular faces of decomposed gneiss, exposed but moist and springy (n. 268); Mercara, damp banks by roadside (n. 24); banks of decomposed gneiss near Mercara (n. 28); Verajpet, wet grassy banks in rice fields (n. 162).

*Trematodon ceylonensis* C. Müll.

Coorg: shady clay banks near Mercara (n. 17).

## CAMPYLOPODIUM C. Müll.

*Campylopodium khasianum* (Griff.) Par.

Syn. *Leptotrichum khasianum* Mitt., Musc. Ind. or. p. 8.

Coorg: dry clay banks near Mercara (n. 30).

## DICRANELLA Schimp.

*Dicranella pomiformis* (Griff.) Jaeg.

Syn. *Leptotrichum pomiforme* Mitt., Musc. Ind. or. p. 8.

Coorg: dry clay banks near Mercara (n. 36, 273).

*Dicranella Griffithii* (Mitt.) Jaeg.

Syn. *Leptotrichum Griffithii* Mitt., Musc. Ind. or. p. 9.

Coorg: clay banks near Paluru (n. 42); clay banks near Mercara (n. 60); damp shady hillside eight miles from Mercara, on the Mangalore road (n. 76); clay banks near Verajpet (n. 157).

## CAMPYLOPUS Brid.

*Campylopus Goughii* (Mitt.) Jaeg.

Syn. *Dicranum Goughii* Mitt. l. c. p. 17.

Coorg: close mats on trunks of trees by roadside near Paluru (n. 44).

*Campylopus nigrescens* (Mitt.) Jaeg.

Syn. *Dicranum nigrescens* Mitt. l. c. p. 19.

Coorg: Murnad, forms large cushions on dry exposed gneiss (n. 93); dry sunny hillsides and clay banks in vicinity of Mercara (n. 34, 274).

LEUCOLOMA Brid.

*Leucoloma Walkeri* Broth. n. sp.

*Dioicum*; gracile, caespitosum, caespitibus densis, viridibus, haud nitidis; *caulis* vix ultra 1 cm. altus, erectus vel adscendens, basi fusco-radiculosus, dense foliosus, simplex; *folia* sicca crispatula, humida flexuosula, patentia, canaliculato-concava, e basi lanceolata sensim subulata, hyalino-mucronata, marginibus erectis, integerrimis vel summo apice dentibus paucis, minutis praeditis, limbata, limbo angustissimo, hyalino, superne evanido, nervo angusto, infra summum apicem evanido, dorso laevi, cellulis minutis, quadratis, papillosis, subobscuris, basilaribus anguste rectangularibus, laevibus, alaribus magnis, numerosis, fusco-aureis; *bracteae perichaetii* e basi semivaginante, tenere reticulata subulatae; *seta* 6 mm. alta, stricta, tenuis, rubra; *theca* erecta, c. 1.5 mm. altâ, anguste subcylindrica, pallide fusca, nitidula. Caetera ignota.

South Coorg: decayed wood in shady jungle (n. 294).

Species ob folia angustissima limbata, limbo superne evanido peculiaris, habitu *L. caespitulanti* C. Müll. similis.

*Leucoloma Renauldii* Broth. n. sp.

*Dioicum*; gracile, caespitosum, caespitibus laxis, viridibus, nitidiusculis; *caulis* vix ultra 1 cm. altus, adscendens, tenuis, niger, densiuscule foliosus, superne dichotomus vel simplex; *folia* sicca vix flexuosula, humida strictiuscula, patula, comalia vix subsecunda, canaliculato-concava, e basi anguste lanceolata sensim setacea, marginibus erectis in parte superiore subulae serrulatis, limbata, limbo basi c. 0.025 mm. lato, superne sensim angustiore, usque ad apicem continuo, nervo angusto, cum apice evanido, dorso laevi, cellulis minutis, quadratis, chlorophyllosis, sublaevibus, basin versus sensim longioribus, basilaribus anguste linearibus, alaribus magnis, numerosis, fusco-aureis; *bracteae perichaetii* e basi vaginante, tenero-reticulata longe setaceae; *seta* 4 mm. alta, stricta, tenuis, rubra; *theca* erecta, ovalis, fusca, nitidula; *peristomium* simplex; *exostomii* dentes erecti, c. 0.2 mm. longi et c. 0.05 mm. lati, irregulariter fissi, aurantiaci, laeves; *spori* 0.018—0.02 mm., fusciduli, minutissime papilloso; *operculum* e basi conica rostratum, rostro c. 1 mm. alto, recto; *calyptra* cucullata, basi laciniata, ultra medium thecae producta.

Coorg: on trees in very dense jungle 7 miles S.-W. of Verajpet (n. 293).

Species pulchella, tenella, foliis angustissimis, cellulis sublaevibus jam memorabilis, cum nulla specie indica adhuc cognita comparanda.

### LEUCOBRYACEÆ.

#### LEUCOBRYUM Hamp.

##### *Leucobryum imbricatum* Broth. n. sp.

*Dioicum*; gracile, caespitosum, caespitibus densissimis, rigidis, latissimis, glauco-viridibus, hand nitidis; *caulis* usque ad 4 cm. altus, erectus, dense foliosus, dichotome ramosus, ramis erectis, fastigiatis obtusis; *folia* sicca arcte imbricata, humida erecto-patentia, elliptico-lanceolata, obtusissima, apiculo minuto, hyalino terminata, 2—2.5 mm. longa, dorso laevia, marginibus erectis, superne involutis, integerrimis, limbata, limbo hyalino, a seriebus cellularum 3—4 formato, usque ad apicem producto, lamina e stratis cellularum aequalium duobus composita. Caetera ignota.

Coorg: tree trunks in dry open jungle near Verajpet (n. 292); Murnad, on tree trunks in dry open places (n. 107).

Species *L. Wightii* admodum similis, sed statura rigida nec non foliorum forma et structura longe diversa.

##### *Leucobryum Wightii* Mitt., Musc. Ind. or. p. 25.

Coorg: logs on roadside near Nalknad Palace (n. 327, 328).

#### OCTOBLEPHARUM Hedw.

##### *Octoblepharum albidum* (L.) Hedw.—Mitt. l. c. p. 95.

Coorg: leaves and trunks of trees in coffee gardens, Verajpet (n. 139).

### FISSIDENTACEÆ.

#### FISSIDENS Hedw.

##### *Fissidens anomalus* Mont.—Mitt., Musc. Ind. or. p. 137.

Coorg: on decayed logs in jungle on Tadiandamol peak, 5729 (n. 310).

##### *Fissidens carnosus* Broth. n. sp.

*Dioicus*; caespitosus, caespitibus densis, mollibus, usque ad 2 cm. altis, sordide atro-viridibus; *caulis* erectus, flexuosus, dense foliosus, cum foliis 2—3 mm. latus, vage ramosus; *folia* multijuga, flaccida, carnosa, erecto-patentia, saepe destructa, inferiora oblongo-ligulata obtusissima, superiora longiora, obtusiuscula, integerrima, elimbata, lamina vera lamina apicali longior, lamina dorsalis ad basin nervi enata, nervo rufescente, basi crassiusculo, superne multo tenuiore,

infra summum apicem evanido, cellulis rotundato-hexagonis, c. 0.02 mm., parce chlorophyllosis, laevissimis; *seta* terminalis, plerumque solitaria, adscendens, 4 mm. alta, crassiuscula, rubra, laevis; *theca* erecta vel suberecta, obovata, minuta, fuscidula; *peristomium* simplex, dentibus 16, purpureis, basi connatis, c. 0.3 mm. longis basi c. 0.05 mm. latis, dense papillosis, ultra medium in cruribus duobus filiformibus fissis; *operculum* e basi cupulato rostratum, rostro brevi, recto. *Calyptra* ignota.

Coorg: granite rocks in stream of clear water near Hatur (n. 178).

Species valde peculiaris, ob folia *carnosa*, cellulis magnis, pellucidis, laevissimis cum nulla alia commutanda.

***Fissidens lutescens* Broth. n. sp.**

*Dioicus*; gracilis, caespitosus; caespitibus densis, lutescenti-viridibus; *caulis* 1 cm. vel paulum ultra altus, flexuosus, basi fusco-radiculosus, densiuscule foliosus, cum foliis vix 2 mm. latus, parce ramosus vel simplex; *folia* multijuga, sicca circinato-involuta, humida homomalla, elongate lanceolata, breviter acuminata, superne ob cellulas prominentes minutissime serrulata, elimbata, lamina vera lamina apicali longior lamina dorsalis ad basin nervi enata, ibidemque rotundata, nervo lutescente, infra summum apicem evanido, cellulis minutis, subrotundis, c. 0.01 mm., grosse papillosis. Caetera ignota.

Coorg: damp clay banks near Verajpet (n. 159).

Species *F. involuto* Wils., proxima, sed foliis nervo infra apicem evanido cellulisque grosse papillosis jam dignoscenda.

***Fissidens excedens* Broth. n. sp.**

*Dioicus*; caespitosus, caespitibus densis viridissimis, aetate nigrescentibus; *caulis* 1 cm. altus, dense foliosus, cum foliis 3 mm. latus, parce ramosus; *folia* multijuga, sicca homomalla, comalia subcircinato-involuta, humida strictiuscula, lanceolato-ligulata, obtusiuscula, mucronata, superne ob cellulas prominentes minutissime serrulata, elimbata, lamina vera lamina apicali longior, lamina dorsalis ad basin nervi enata, nervo pallido, in mucronem excedente, cellulis minutis, 0.007—0.010 mm. subrotundis, ob papillas minutas subobscuris. Caetera ignota.

Coorg: dry shady clay banks near Sidapur (n. 284.)

Species cum praecedente et *F. involuto* comparanda, sed nervo in mucronem excedente jam dignoscenda.

***Fissidens fuscoviridis* Thw. Mitt.**

Coorg: trees near Watakoli (n. 147); tree trunks in coffee gardens at Verajpet (n. 137).

***Fissidens Walkeri* Broth. n. sp.**

*Dioicus*; tenellus, gregarius, laete viridis; *caulis* ad 5 mm. usque altus, erectus, strictus, infima basi radiculosus, dense foliosus cum

foliis c. 1.5 mm. latus, simplex; *folia* usque ad 12-juga, sicca homomalla, erecto-patentia, oblonga, acuta, ob cellulas prominentes minutissime serrulata, lamina vera lamina apicali parum longior, limbata, limbo hyalino, ad medium laminae evanido, lamina dorsalis ad basin nervi enata ibidemque rotundata, nervo pallido vel lutescente infra summum apicem evanido, cellulis rotundato-hexagonis, 0.007—0.01 mm., valde chlorophyllosis; *seta* terminalis, solitaria, 3 mm. alta, adscendens, tenuis, rubra, laevissima; *theca* minuta, suberecta, urceolata, leptodermis, pallida. Caetera ignota.

Coorg: clay banks near Bhagamandala (n. 334).

Species *F. pennatulo* Thw. Mitt. habitu similis sed foliis latioribus, limbo laminae verae brevior nec non nervo infra summum apicem evanido optime diversa.

*Fissidens ellimbatus* Broth. n. sp.

Species præcedenti simillima, sed laminis omnibus elimbatis dignoscenda.

Coorg: moist clay banks by roadside near Verajpet (n. 151).

*Fissidens coorgensis* Broth. n. sp.

*Diöicus*; gregarius, fusciscenti-viridis; *caulis* vix ultra 2 mm. altus, basi fusco-radiculosus, densiuscule foliosus, simplex; *folia* paucijuga, erecto-patentia, flaccida, sicca contractula, elongate elliptico-lanceolata, acuta, integerrima, laminis omnibus angustissime limbatis; lamina vera lamina dorsali multo brevior, lamina dorsali basi angusta et paulum decurrens, nervo lutescente, flexuosulo, cum apice evanido, cellulis rotundato-hexagonis, 0.007—0.01 mm., chlorophyllosis, pellucidis, laevissimis; *seta* 8 mm. alta, flexuosula, tenuissima, rubra, laevissima; *theca* minuta, ovalis, erecta, leptodermis, fuscicula. Caetera ignota.

Coorg: dry shady clay banks near Sidapur (n. 267).

Species *F. flabellulo* Thw. Mitt. habitu similis, sed statura robustiore foliisque limbatis longe diversa.

## DITRICHACEÆ.

### GARCKEA C. Müll.

*Garckea phascoides* (Hook.) C. Müll.—Mitt., Musc. Ind. or. p. 8.

Coorg: Mercara, shady banks by roadside (n. 25); dry clay banks and decomposed gneiss near Mercara (n. 59, 72); Verajpet, dry granite rocks (n. 139); dry open banks of decomposed gneiss near Murnad (n. 106); walls of compound of travellers' bungalow at Watekoli (n. 153).

## TORTULACEÆ.

## HYOPHILA Brid.

***Hyophila involuta*** (Hook.) Jaeg.

Syn. *Desmatodon involutus* Mitt., Musc. Ind. or. p. 39.

Coorg: dry decomposing pegmatite near Verajpet (n. 125); dry rocks in bed of Cauvery river, Fraserpet (n. 271).

***Hyophila cylindrica*** (Hook.) Jaeg.

Coorg: dry steep faces of gneiss 8 miles east of Mercara (n. 11); plastered walls of the fort at Mercara (n. 18); on tomb-stones in shady places near Murnad (n. 110); steep rocky banks, Verajpet (n. 122); rocks in coffee gardens, Sidapur (n. 265); on granite rocks by riverside near Gonikopaul (n. 201) on dry rocks in river-bed (n. 208); rocks in river-bed near Titimati (n. 254).

***Hyophila Walkeri*** Broth. n. sp.

*Dioica*; pusilla, laxissime caespitosa vel gregaria fuscidula, haud nitida; *caulis* vix ultra 1 mm. altus, infima basi radiculosus, dense foliosus, simplex; *folia* sicca incurva, humida suberecta carinato-concava, oblonga vel oblongo-spathulata, obtusiuscula, mutica vel brevissime mucronata, marginibus erectis, integerrimis, nervo crasso, rufescente, basi c. 0.05 mm. lato, cum apice evanido vel brevissime excedente, dorso laevi, cellulis subrotundis, c. 0.010 mm., papillosis, basilaribus hexagono-oblongis, inanibus, laevissimis; *seta* 2-4 mm. alta, tenuis, stricta, lutea; *theca* erecta, oblongo-cylindrica, atro-purpurea, laevis, gymnostoma; *spori* 0.02 mm., virides, papilloso; *operculum* conico-subulatum, curvatum.

Coorg: Verajpet, sparingly on tree trunks in coffee gardens (n. 134); tree trunks in dry jungle near Hatur (n. 173); tree trunks at Ponnepet (n. 240).

Species distinctissima, pulchella, cum nulla specie indica commutanda.

## BARBULA Hedw.

***Barbula comosa*** Doz. Molk.—Mitt. Musc. Ind. or. p. 35.

Coorg: dry decomposed rocks near Mercara (n. 78); damp sandy soil by side of stream near Hatur (n. 186).

***Barbula indica*** (Hook.) Brid.

Syn. *Tortula indica* Mitt. l. c. p. 30.

Coorg: a lime-loving moss,—on plastered portion of bridges near Verajpet (n. 156).

## TORTELLA (C. Müll.) Limpr.

*Tortella hyalinoblasta* Broth. n. sp.

Tenella, caespitosa, caespitibus humillimis, viridibus, laxiusculis, haud nitidis; *caulis* 1—3 mm. altus, infima basi fusco-radiculosus, dense foliosus, simplex; *folia* sicca circinato-incurva, numida erecto-patentia, carinato-concava, sublinearia, obtusa, mucronata, c. 2.5 mm. longa et 0.3—0.35 mm. lata, marginibus erectis, integerrimis, nervo basi c. 0.06 mm. lato, superne tenuiore, in mucronem excedente, dorso nitido, lævi, cellulis rotundato-quadratis, c. 0.010 mm., valde chlorophyllosis, minute papillois, basilaribus rectangularibus, inanibus, marginem versus angustioribus, laevissimis. Caetera ignota.

Coorg: on trunks of trees in jungle (n. 205); trees in bamboo forest near Pollebetta (n. 219); trees at Ponnappet (n. 239).

Species *T. caespitosae* (Schwaegr.) Limpr. affinis, sed statura graciliore, foliis obtusis, cellulis majoribus dignoscenda.

## ORTHOTRICHACEÆ.

## MACROMITRIUM Brid.

*Macromitrium Moorcroftii* Schwaegr.

Coorg: tree trunks near Verajpet (n. 291).

*Macromitrium nepalense* Schwaegr.

Coorg: branches in tree-tops near Mercara (n. 46, 51); tree trunks near Murnad (n. 80).

*Macromitrium sulcatum* Brid.

Coorg: on trunks of trees in coffee gardens on Verajpet hill (n. 115); trees near Ponnappet (n. 247); tree trunks near Gonikopaul (n. 253); Hatur, branches of trees in bamboo jungle (n. 182); tree trunks on Tadiandamol peak, altitude 5726' (n. 317, 325).

*Macromitrium* (*Leiostoma*) *leptocarpum* Broth. n. sp.

*Dioicum*; sat robustum, caespitosum, caespitibus densis, fusco-viridibus, haud nitidis; *caulis* elongatus, repens, densissime ramosus, ramis erectis, strictis, usque ad 1.5 cm. altis, dense fusco-radiculosis, simplicibus vel divisis, dense foliosis, obtusis; *folia* sicca incumbenti-contorta, humida patentia, oblongo-lanceolata, acuta, marginibus erectis, apice minute serrulatis nervo rufescente, infra summum apicem evanido, cellulis minutis, rotundatis, c. 0.007 mm., pellucidis, sublaevibus, basilaribus elongatis, lumine angustissimo, flexuosulo, grosse papillois, ad nervum uno latere laxis, calymperoideis; *bracteae perichaetii* foliis subsimiles; *seta* lateralis, 1 cm. alta, strictiuscula, tenuis, rubra; *theca* erecta, anguste cylindrica, c. 2 mm. alta, laevis, atro-purpurea;

*peristomium* duplex ; *exostomii* dentes lutei, obtusi, papillosoi ; *inter-num* hyalinum ; *spori* valde inæquales, 0.012—0.025 mm., virides, laeves ; *operculum* aciculare, rectum ; *calyptra* sordide fuscidula, thecam totam obtegens, plicata, basi laciniata, glabra.

Coorg : on trees in exposed situations near Mercara (n. 1, 7, 69) ; Mercara, exposed granite rocks (n. 68) ; dry jungle near Verajpet (n. 132).

Species *M. sulcato* affinis. sed theca anguste cylindrica, laevi facillime jam dignoscenda.

### FUNARIACEÆ.

#### FUNARIA Schreb.

*Funaria leptopoda* Griff.—Mitt., Musc. Ind. or. p. 56.

Coorg : dry banks and moist banks near Paluru (n. 48, 54, ; clay banks and dry banks of decomposed gneiss near Mercara (n. 13, 55) ; Watekoli, bare earth near dwellings (n. 152) ; burned ground near Fraserpet (n. 276) ; Verajpet, clear spots of earth free from all other vegetation (n. 118)

#### PHYSCOMITRIUM (Brid.) Br. Sch.

*Physcomitrium coorgense* Broth. n. sp.

*Autoicum* ; gregarium, viride ; *caulis* 3 mm. altus, basi longe fusco-radiculosus, inferne laxe, superne dense foliosus, simplex ; *folia* inferiora minuta, comalia multo majora, patula, anguste obovata vel spathulata, acuminata, limbata, limbo angustissimo, ex unica serie cellularum formato, superne minute serrulato, nervo lutescente, breviter excedente, cellulis laxis, ovali-hexagonis, basilaribus multo longioribus, rhomboideis ; *seta* 8 mm. alta, strictiuscula, tenuis, rubra ; *theca* erecta e collo longiusculo subhemisphærica, macrostoma, demum atropurpurea, cellulis transversis sub ore biseriatis ; *spori* 0.025 mm, fusci, papillosoi ; *operculum* convexum, umbonatum.

Coorg : Verajpet, dry shady banks (n. 170).

Species *Ph. acuminato* (Schleich.) Br. eur. similis, sed foliorum forma et theca cellulis transversis sub ore biseriatis longe diversa.

### SPLACHNACEÆ.

#### TAYLORIA Hook., Mitt.

*Tayloria Schmidii* (C. Müll.).

Syn. *Dissodon Schmidii* C. Müll., Flora. 1874, n. 18.

Coorg : Pollebetta, dry logs in forest (n. 228).

## BRYACEÆ.

## BRYUM Dill.

*Bryum giganteum* Hook.—Mitt. Musc. Ind. or. p. 75.

Coorg: on black loam in damp jungle on Tadiandamol peak, 5729' (n. 311).

*Bryum ramosum* (Hook.) Mitt. Musc. Ind. or. p. 75.

Coorg: dry clay banks near Verajpet (n. 290).

*Bryum medianum* Mitt. l. c. p. 74.

Coorg: Ponnepet, dry earth under trees in bamboo jungle (n. 243).

*Bryum Wightii* Mitt. l. c. p. 74.

Coorg: damp earth near Nalknad Palace (n. 329); Mercara, by small spring at the foot of a cliff of gneiss (n. 280).

*Bryum apalodictyoides* C. Müll.—Mitt. l. c. p. 74.

Coorg: dry woods and dry exposed rocks in bamboo jungle near Hatur (n. 189, 191); near Nalknad Palace on tree trunks (n. 325).

*Bryum erythrinum* Mitt. l. c. p. 70.

Coorg: dry clay banks near Verajpet (n. 145); dry clay banks near Pollebetta (n. 214); dry clay banks near Gonikopaul (n. 203); Mercara, on bridge stones near water (n. 33).

*Bryum doliolum* Duby.

Coorg: dry clay banks at Pollebetta (n. 215); Ponnepet, logs in bamboo jungle (n. 238); black charred stumps in jungle near Titimati (n. 259).

*Bryum argenteum* L.—Mitt. l. c. p. 69.

Coorg: surface of large stones, dry clay banks and trees near Mercara (n. 31, 39, 67); Hatur, dry rocks (n. 193).

## ANOMOBRYUM Schimp.

*Anomobryum cymbifolium* (Lindl.).

Syn. *Bryum filiforme* Mitt. l. c. p. 67.

Coorg: bare gneiss hills near Sidapur (n. 258).

## BRACHYMENIUM Hook.

*Brachymenium Walkeri* Broth. n. sp.

*Dioicum*; caespitosum, caespitibus densis, mollibus, inferne fusco-tomentosis, lutescentibus, sericeis; *caulis* brevissimus, dense foliosus, innovationibus binis, usque ad 1 cm. vel paulum ultra altis; *julaceis*, flexuosulis, dense foliosis, obtusis; *folia* sicca et humida imbricata,

concava, ovato-vel ovali-lanceolata, acuminata, nervo excedente aristata, marginibus inferne paulum revolutis, intergerrimis, elimbata, nervo crassiusculo, in aristam brevem, integram excedente, cellulis teneris, laxe rhomboideis, basilaribus laxis, subquadratis; *bractee perichaetii* sensim longe subulato-acuminatae, integrae; *seta* usque ad 2.5 cm. alta, tenuis, flexuosula, rubra; *theca* erecta, cum collo sporangium subaequante pyriformis, c. 2 mm alta et vix 1 mm. lata, atro-fusca, laevis, collo siccitate plicato; *annulus* c. 0.090 mm. latus, per partes secedens; *peristomium* duplex; *exostomii* dentes c. 0.25 mm. alti et c. 0.09 mm. lati, rufescentes apice hyalini, lamellis c. 15; *endostomium* sordide luteum, minute papillosum corona basilaris, c. 0.12 mm. alta, processibus nullis; *spori* 0.015—0.017 mm., olivacei, sublaeves; *operculum* minutum, conico-cupulatum, obtusum.

Coorg: on steep faces of gneiss 8 miles east of Mercara (n. 10); Mercara, dry banks (n. 27); dry banks near Paluru (n. 43); Mercara, damp clay banks (n. 47); dry clay banks near Murnad (n. 81); Verajpet. common on dry clay banks (n. 124, 154); Pollebetta, dry clay banks by roadside in coffee gardens (n. 213).

Species *Br. acuminato* Harv. affinis, sed foliis nervo multo tenuiore, brevius excedente cellulisque multo longioribus, tenerioribus facilliter dignoscenda.

***Brachymentium Weissiae* Hook.**

Syn. *Bryum Weissiae* Mitt. Musc. Ind. or. p. 68.

Coorg: trees in Mercara (n. 38); Murnad, dry clay banks (n. 83); damp granitic rocks near Hatur (n. 185).

***Brachymentium leptostomoides* (C. Müll.) Schimp.**

Syn. *Bryum leptostomoides* C. Müll.—Mitt. Musc. Ind. or. p. 74.

Coorg: tree trunks near Murnad (n. 89).

***Brachymentium nepalense* Hook.**

Syn. *Bryum nepalense* Mitt. Musc. Ind. or. p. 73.

Coorg: very common on tree trunks in open places (n. 2); on trees in open places—vicinity of Mercara (n. 32); trees in open sunny places near Mercara (n. 67); tree trunks near Murnad (n. 91); on trunks of coffee shrubs near Verajpet (n. 128); dry exposed rocks in jungle near Hatur (n. 184); trees in dry jungle near Hatur (n. 194); tree trunks near Sidapur (n. 270); on dry logs in forest at Pollebetta (n. 233).

## BARTRAMIACEÆ.

### PHILONOTIS Brid.

***Philonotis angusta* Mitt. Musc. Ind. or. p. 61.**

Coorg: forms big mats on dry rocks near Mercara (n. 56).

***Philonotis imbricatula* Mitt. l. c. p. 61.**

Coorg : clay banks at Verajpet (n. 17, 158) ; dry clay banks near Murnad (n. 87, 101, 102) ; Sidapur, stumps in dry forest and logs in coffee gardens (n. 262, 269).

***Philonotis heterophylla* Mitt. l. c. p. 61.**

Coorg : Paluru, clay banks (n. 53) ; dry clay banks by roadside near Verajpet (n. 142, 168).

***Philonotis mollis* (Doz. Molk) Br. jav.—var.**

Coorg : shady banks of decomposed gneiss near Mercara (n. 12) ; on dry and moist clay banks near Mercara (n. 26, 279) ; moist shady clay banks near Murnad (n. 104) ; on dry clay banks near Gonikopaul (n. 204) ; on dry clay banks near Verajpet (n. 143).

## POLYTRICHACEÆ.

## POLYTRICHUM Dill., Ehrh.

***Polytrichum Neesii* C. Müll.—Mitt. Musc. Ind. or. p. 151, sub *Pogonato*.**

Coorg : dry clay banks and moist banks of decomposed rocks near Mercara (n. 15, 35).

***Polytrichum hexagonum* (Mitt.)**

Syn. *Pogonatum hexagonum* Mitt. l. c. p. 151.

Coorg : damp clay banks and moist banks of decomposed gneiss near Mercara (n. 14, 21, 282) ; moist clay banks near Verajpet (n. 161) ; close mats on damp banks near Paluru (n. 45, 49).

## HYPOPTERYGIACEÆ.

## RACOPILUM Brid.

***Racopilum indicum* Mitt. l. c. p. 136.**

Coorg : on clay and dry rocks in jungle near Gonikopaul (n. 249, 252) ; Hatur, tree trunks in open jungle (n. 192).

## CYATHOPHORUM Brid.

***Cyathophorum Adiantum* Mitt. l. c. p. 147.**

Coorg : on decayed wood in jungle on Tadiandamol peak, alt. 5729' (n. 314).

## HOOKERIACEÆ.

## DALTONIA Hook.

***Daltonia reticulata*** C. Müll.

Coorg: Tadiandamol peak, on dead bamboo rods (n. 301).

## NECKERACEÆ.

## ACROCRYPHÆA Br. eur.

***Acrocryphaea concavifolia*** (Griff.) Br. jav.

Syn. *Cryphaea concavifolia* Mitt. Musc. Ind. or. p. 125.

Coorg: Verajpet, branches of coffee shrubs (n. 127); on branches of orange trees near Hatur (n. 174); trees in exposed places near Murnad (n. 82); South Coorg, on branches of small trees in bamboo jungle (n. 209).

## METEORIUM Brid.

***Meteorium tumidum*** (Dicks.) Mitt. l. c. p. 86.

South Coorg: branches of orange trees (n. 296).

***Meteorium squarrosum*** (Hook.) Mitt. l. c. p. 87.

Coorg: Verajpet, on earth beneath trees in coffee gardens (n. 119).

***Meteorium reclinatum*** (C. Müll.) Mitt. l. c. p. 87.

Coorg: hangs from trees in streets of Mercara (n. 3, 16, 20); forms large close mats on trees 10 miles from Mercara, on the Mangalore road (n. 71); base of trees in dry jungle at Verajpet (n. 167).

***Meteorium enerve*** Thw. Mitt.

Coorg: Mercara, hangs from branches of trees (n. 58); hangs from branches of trees at Paluru (n. 40); hangs from branches of trees near Nalknad Palace (n. 323).

***Meteorium filamentosum*** (Hook.) Mitt. l. c. p. 91.

Coorg: Verajpet, coffee shrubs in an ill-kept garden (n. 140).

## TRACHYPUS Reinw. Hornsch.

***Trachypus blandus*** (Harv.) Mitt. l. c. p. 127.

Coorg: on trees in streets of Mercara (n. 5); branches of trees in open sunny places near Mercara (n. 66); tree trunks 10 miles from Mercara, on the Mangalore road (n. 70).

***Trachypus crispatus*** (Hook.) Mitt. l. c. p. 129.

Coorg: trees in dry jungle on Tadiandamol peak (n. 306).

## PAPILLARIA C. Müll.

***Papillaria fuscescens*** (Hook.) Jaeg.

Syn. *Trachypus fuscescens* Mitt. l. c. p. 128.

Coorg : trees near Paluru (n. 41); branches of orange trees at Hatur (171, 177); Verajpet, coffee shrubs (n. 141); trees near Murnad (n. 96); perpendicular faces of cliffs near Mercara (n. 63).

***Papillaria floribunda*** (Doz. Molk.) C. Müll.

Coorg : Pollebetta, bark of trees (n. 224, 235); trees near Paluru (n. 50); Verajpet, hangs from the trunks and branches of coffee bushes (n. 114, 121).

AEROBRYUM Doz. Molk.

***Aerobryum longissimum*** (Doz. Molk.) C. Müll.

Coorg : hangs from branches of trees in dry open jungle at Murnad (n. 108).

PTEROBRYUM Hornsch.

***Pterobryum Walkeri*** Broth. n. sp.

*Dioicum*; sat robustum, lutescenti-viride, nitidum; *caulis* repens elongatus, densissime ramosus, ramis 2-3 cm. altis, erectis, superne arcuatis, crassis, julaceis, filis articulatis numerosis, dense foliosis, simplicibus vel subsimplicibus, obtusis; *folia* sicca imbricata, humida patentia, cochleariformi-concava, ovato-ovalia, apiculo lato, acuto terminalis, marginibus erectis, integerrimis vel superne subintegris, nervo lutescente, ultra medium evanido, cellulis elongatis, angustissimis, basilaribus infimis brevioribus et laxioribus aureis, inter se porosis, alaribus numerosis, quadratis, fusco-aureis, omnibus laevissimis; *bracteae perichaetii* erectae, longe vaginantes, acuminatae, integerrimae; *seta* erecta, 8 mm. alta, rubra, laevissima; *theca* erecta, oblonga, crassicollis, fusca. Caetera ignota.

Coorg : Mercara, dry exposed rocks (n. 74); stones on Mangalore road five miles from Mercara (n. 75); in exposed places on trunks of large trees near Mercara (n. 79); Hatur, on branches of orange trees (n. 150).

Species distinctissima, a *Pt. frondoso* (Mitt.) proximo ramis simplicibus, foliis cellulis alaribus numerosis, magnis et seta longiore optime diversa.

***Pterobryum frondosum*** (Mitt.)

Syn. *Meteorium frondosum* Mitt. Musc. Ind. or. p. 86.

Coorg : on tree trunks in jungle on Tadiandamol peak (n. 307).

***Pterobryum gracile*** Broth. n. sp.

*Dioicum*; gracile, lutescenti-viride, nitidum; *caulis* repens, ramosus, ramis usque ad 5 cm. altis, erectis, superne arcuatis, julaceis, dense foliosis, pinnatim ramulosis, ramulis usque ad 2 cm.

longis, julaceis, obtusis; *folia* sicca imbricata, humida erecto-patentia, cochleariformi-concava, ovato-ovalia, acuta, marginibus erectis, sub-integris, nervo lutescente ad basin acuminis evanido, cellulis elongatis, angustis, alaribus numerosis, quadratis, incrassatis, fusco-aureis, supra-alaribus numerosis, multo minoribus, quadratis, hand incrassatis, omnibus laevissimis. Caetera ignota.

Coorg: tree trunks in bamboo jungle near Pollebetta (n. 217); tree trunks in coffee plantations on Verajpet hill (n. 113); base of trees in exposed places near Murnad (n. 84).

Species *Pt. frondoso* affinis, sed statura multo graciliore nec non foliis nervo longiore, cellulis supraalaribus numerosis, quadratis longe diversa.

***Pterobryum Schmidii* (C. Müll.).**

Syn. *Meteorium Schmidii* Mitt. Musc. Ind. or. p. 91.

Coorg: dry clay banks near Mercara (n. 22); hangs from branches of trees in streets of Mercara (n. 4, 8); Verajpet, branches of trees in coffee gardens (n. 123); hangs in tufts from branches of trees on Tadiandamol peak (n. 303).

***Pterobryum involutum* Thw. Mitt.**

Coorg: on trunks of trees in open jungle on Tadiandamol peak, 5729' (n. 305, 313).

***Pterobryum patulum* Broth. n. sp.**

*Dioicum*, robustum, lutescenti-viride, nitidum; *caulis* elongatus, repens, ramosus, ramis remotis, erectis, 2 cm. vel paulum ultra altis, arcuatulis, densiuscule foliosis, simplicibus, obtusis; *folia* sicca et humida horride patula, cochleariformi-concava, e basi cordata alis parvis circinatis, undulatis late ovata, in acumen breve, angustum contracta, marginibus erectis, integris vel subintegris, nervo tenui, longe ultra medium evanido, cellulis elongatis, angustissimis, basilaribus abbreviatis, inter se porosis, fusco-aureis, auricularibus parvis, hyalinis, omnibus laevissimis. Caetera ignota.

Coorg: Murnad, base of large trees in open forest (n. 88).

Species *Pt. Wightii* (Mitt.) proxima, sed statura multo robustiore foliisque horride patentissimis oculo nudo jam dignoscenda.

**NECKERA Hedw.**

***Neckera rugulosa* Mitt. l. c. p. 121.**

Coorg: roots of trees in dry forest near Verajpet (n. 288).

**HOMALIA Br. eur.**

***Homalia flabellata* (Dicks.) Br. jav.—**

Syn. *Neckera flabellata* Mitt. l. c. p. 118.

Coorg: tree trunks in dry jungle near summit of Tadiandamol peak, 5729' (n. 308, 309).

POROTRICHUM Brid.

*Porotrichum alopecuroides* (Hook.) Br. jav.

Syn. *Neckera alopecuroides* Mitt. l. c. p. 123.

Coorg: tree trunks in shady forest, Pollebetta (n. 221).

SEMATOPHYLLACEÆ.

CHIONOSTOMUM C. Müll.

*Chionostomum rostratum* (Griff.) C. Müll.

Syn. *Stereodon rostratum* Mitt. l. c. p. 102.

Coorg: branches of trees near Mercara (n. 64, 65); Sidapur, bare gneiss on hill-sides in coffee gardens (n. 266); Tadiandamol peak, dead bamboo twigs (n. 302); Verajpet, branches in jungle (n. 131).

TRICHOSTELEUM Mitt.

*Trichosteleum monostictum* (Thw. Mitt.).

Coorg: decaying wood near Bhagamandala (n. 335); Tadiandamol peak, alt. 5729' (n. 321); on rotten logs in dry jungle in South Coorg (n. 146).

RHAPHIDOSTEGIUM Schimp.

*Rhaphidostegium tristiculum* (Mitt.) Jaeg. Sauerb.

Syn. *Stereodon tristiculus* Mitt. l. c. p. 102.

Coorg: Verajpet, stalks of coffee shrubs in abandoned coffee gardens (n. 129, 166); Ponnepet, trees (n. 244); Sidapur, tree trunks in coffee gardens (n. 261); trees in vicinity of Mercara (n. 61).

SEMATOPHYLLUM Mitt.

*Sematophyllum angusticuspes* Broth. n. sp.

*Dioicum*? caespitosum, caespitibus densis, lutescentibus, nitidis; *caulis* elongatus repens, pinnatim ramosus, ramis brevibus, suberectis, strictis, dense foliosis, cuspidatis, simplicibus; *folia* concava, patentia, oblonga, in cuspidem angustum, subpiliformem subito contracta, marginibus erectis, apice subconniventibus, integerrimis, enervia, cellulis elongatis, angustis, basilaribus infimis abbreviatis, aureis, alaribus numerosis, biseriatis infimis majoribus, vesiculaeformibus, aureis vel hyalinis, omnibus laevissimis. Caetera ignota.

Coorg : dry clay banks and dry earth near Verajpet (n. 136, 160) ; dry rocks in South Coorg (n. 295) ; crevices in rocks, Tadiandamol peak (n. 319) ; tree trunks at Gonikopaul (n. 260).

Species *S. hermaphrodito* (C. Müll.) habitu simillima, sed foliorum forma longe diversa.

## STEREODONTACEÆ.

### ISOPTERYGIUM Mitt.

*Isopterygium taxirameum* (Mitt.) Jaeg. Sauerb.

Syn. *Stereodon taxirameus* Mitt. l. c. p. 105.

Coorg : clay banks by roadside near Nalknad Palace (n. 320) ; bed of small stream near Verajpet (n. 164) ; Verajpet, dry banks (n. 172) ; on dry clay banks near Hatur (n. 180) ; Pollebetta, on dry sod in bamboo jungle (n. 230).

*Isopterygium lignicola* (Mitt.) Jaeg. Sauerb.

Syn. *Stereodon lignicola* Mitt. l. c. p. 104.

Coorg : coffee gardens near Sidapur (n. 263) ; Pollebetta, logs in damp jungle (n. 226) ; on roots and base of bamboos near Pollebetta (n. 218) ; on small trees in shady jungle near Hatur (n. 179, 181) ; Verajpet, on trunks of trees in coffee gardens (n. 133) ; South Coorg, on bamboo stumps in shady jungle (n. 206).

### ECTROPOTHECIUM Mitt.

*Ectropothecium cyperoides* (Hook.) Jaeg. Sauerb.

Syn. *Stereodon cyperoides* Mitt. l. c. p. 99.

Coorg : base of trees in coffee gardens near Mercara (n. 281) ; tree trunks near Gonikopaul (n. 250) ; trees at Watekoli near Verajpet (n. 148) ; on dry decaying wood in jungle near Verajpet (n. 112) ; dry sod in open jungle near Pollebetta (n. 162) ; Pollebetta, base of small trees by streams (n. 222) ; dead branches in dry jungle on Tadiandamol peak (n. 304) ; Sidapur, base of trees in coffee gardens (n. 264) ; extreme S.-E. Coorg, damp stones in river bed (n. 256).

*Ectropothecium reticulatum* (Doz. Molk.) Jaeg. Sauerb.

Syn. *Stereodon reticulatum* Mitt. l. c. p. 101.

Coorg : on damp rocks in jungle near Pollebetta (n. 225) ; in bed of Nager River near Mysore Frontier (n. 257).

### ENTODON C. Müll.

*Entodon plicatus* C. Müll.

Syn. *Stereodon plicatus* Mitt. l. c. p. 106.

Coorg: base of tree trunks in jungle near Murnad (n. 92, 111) Pollebetta, coffee gardens (n. 220).

#### ERYTHRODONTIUM Hamp.

*Erythrodontium juliforme* (Mitt.) Pav.

Syn. *Stereodon juliformis* Mitt. l. c. p. 92.

Coorg: dry banks of decomposed rocks near Mercara (n. 85); on trees in South Coorg (n. 210).

#### CAMPYLODONTIUM Doz. Molk.

*Campyodontium flavescens* (Hook.) Br. Jay.

Syn. *Stereodon flavescens* Mitt. l. c. p. 93.

Coorg: base of tree trunks near Murnad (n. 94, 105); Mercara, tree trunks by roadsides (n. 52); Verajpet, on hedge shrubs in open (n. 126); trees in Reserve Forest, extreme S.-E. (n. 255).

#### HYPNACEÆ.

##### STEREOPHYLLUM Mitt.

*Stereophyllum Wightii* (Mitt.) Jaeg. Sauerb.

Syn. *Hypnum Wightii* Mitt. l. c. p. 82.

Coorg: Ponnepet, trees in bamboo forest (n. 245, 246); on trees in streets of Mercara (n. 6); on small tree-trunks in coffee gardens at Pollebetta (n. 212); trees at Watekoli near Verajpet (n. 149).

##### SCHWETSCHKEA C. Müll.

*Schwetschkea indica* Broth. n. sp.

*Autoica*; tenerrimum, caespitosum, caespitibus densiusculis, viridibus; *caulis* elongatus, repens, densissime pinnatim ramosus stands, ramis suberectis, vix ultra 2 mm. longis, strictis, subteretibus, dense foliosis; *folia* sicca imbricata, humida patentia, concaviuscula, ovato-lanceolata acuminata marginibus erectis, superne minutissime denticulatis, nervo viridi, tenui, vix ultra medium producto, rarius indistincto, cellulis ellipticis, basilaribus ad nervum longioribus, ad marginem subquadratis, chlorophyllosis, laevissimis; *bracteae perichaetii* erectae, hyalinae, internae longe et anguste acuminatae, subintegrae; *seta* 4—5 mm. alta, strictiuscula, tenuissima, rubra, superne scaberula; *theca* minuta, erecta, oblonga, sicca deoperculata sub ore paulum constricta, leptodermis, fuscidula, dein nigrescens; *annulus* 0; *peristomium* duplex; *exostomii* dentes anguste lanceolati, dense lamellati, linea media notati, lutei;

*endostomium* luteum, haud papillosum; *processus* filiformes, nodulosi, linea longitudinali percursa laeves; *operculum* e basi conica oblique rostratum

Coorg: trunks of small trees in dry jungle near Pollebetta (n. 231, 232).

HYPNUM Dill., Mitt.

*Hypnum herbaceum* Mitt. l. c. p. 81.

Coorg: on toddy palm, at Murnad (n. 95).

*Hypnum vagans* Harv.—Mitt. l. c. p. 81.

Coorg: damp banks near Verajpet (n. 163); dry shady banks near Verajpet (n. 287).

*Hypnum procumbens* Mitt. l. c. p. 79.

Coorg: forms large mats on dry clay banks near Verajpet (n. 16).

*Hypnum Buchanani* Hook.—Mitt. l. c. p. 78.

Coorg: Hatur, tree in dry jungle (n. 187).

THUIDIUM Br. eur.

*Thuidium blepharophyllum* (C. Müll.) Jaeg. Sauerb.

Syn. *Leskea blepharophylla* Mitt. l. c. p. 133.

Coorg: tree trunks on Tadiandamol near the summit (n. 315, 316); on logs in jungle on Tadiandamol, altit. 5729' (n. 312).

*Thuidium glaucinum* (Mitt.) Br. jav.

Syn. *Leskea glaucina* Mitt. l. c. p. 133.

Coorg: Verajpet, tree trunks in coffee gardens (n. 120).

*Thuidium trachypodium* (Mitt.) Br. jav.

Syn. *Leskea trachypoda* Mitt. l. c. p. 133.

Coorg: logs in jungle at Pollebetta (n. 227, 236); on sandy river banks in bamboo jungle, South Coorg (n. 207).

*Thuidium tamariscellum* (C. Müll.) Br. jav.

Syn. *Leskea tamariscella* Mitt. l. c. p. 134.

Coorg: Verajpet, on trees in dry jungle (n. 144).



# A BOTANICAL TOUR IN THE SOUTH LUSHAI HILLS.

*By A. T. GAGE, M.A., M.B., B.Sc., I.M.S.*

THE following is an account of a short botanical excursion made by the writer in the spring of 1899 to a portion of the South Lushai Hills in accordance with instructions from the Director of the Botanical Survey of India.

The writer left Calcutta on the evening of the 15th March 1899 and arrived at Chittagong on the morning of the 17th, the journey being accomplished partly by rail and partly by river steamer down the combined Ganges and Bramhaputra river. The route then lay in a north-easterly direction up the Karnaphuli river, which flows into the Bay of Bengal at Chittagong, as far as Demagiri; thence directly eastwards across the Lushai ranges to Fort Lungleh. At Chittagong a dug-out manned by three men was engaged to proceed up stream as far as Rangamatti, and a week's provisions were laid in. Late on the evening of the 18th March, the writer accompanied by two servants started on the journey up the river. The boatmen kept to their work the greater part of the night and the next day, halting for meals and a mid-day rest. The night of the 19th was spent camped on the river bank. An early start was made next morning, and Rangamatti, the first 'station' after Chittagong, was reached that afternoon. Rangamatti is sixty-five miles by river from Chittagong, and is situated at an elevation of about 100 feet in a narrow loop of the river, where it first bends to the south-east and then abruptly to the north-west. The station is in the Bengal Presidency, and is a small clean-looking village with a good dāk bungalow. A detachment of Ghurka police are stationed here. An assistant commissioner and a deputy magistrate are the only European residents.

The river here runs between rather steep banks and meanders through a wide, flat, somewhat sparsely wooded vale. Coming up towards Rangamatti, cultivated patches line the river banks here and there, bearing plantains, melons papayas, etc.

The night of the 20th was spent in the Rangamatti dāk bungalow. Through the good offices of the assistant commissioner two

dug-outs were obtained, in place of the one which had done the journey from Chittagong whither it returned.

Early on the morning of the 21st a fresh start was made, and rowing kept up till nightfall, when camp was pitched. Next day Barkhal was reached in the afternoon. The latter part of the journey to Barkhal was difficult and tedious from the dug-out constantly getting aground on shoals or the flat rocks in the river bed.

At Barkhal itself there are nearly two miles of impassable rapids the river here flowing in a gorge, as the name Barkhal implies, with very steep and thickly wooded banks. To get over the difficulty caused by the presence of the rapids the Government has constructed on the north bank of the river a single trolley line of rail running from the foot to the head of the rapids, where the line and the jungle clearing alike cease. The trollies are propelled by Sonthal coolies.

With some difficulty two fresh dug-outs were secured, to take the place of the two from Rangamatti. Accordingly on the morning of the 23rd March the last stage of the river journey was begun, and that night camp was pitched just above the rapids of Utan Chatra, through which the dug-out was hauled by main force.

Next day the 24th, after surmounting one more set of rapids Demagiri was reached and the river journey ended. Demagiri is about fifty-six miles from Rangamatti, that is, about 120 miles from Chittagong by river. Between Barkhal and Demagiri is the boundary between Bengal and Assam.

The scenery for the first twenty or thirty miles up the river differed in no wise from the ordinary plains scenery.

As one journeyed higher up, however, the banks became steeper and more thickly wooded, with multitudinous species of trees and shrubs. Collections were made at each of the halting places so far as time permitted. These, however, are not included in the present report, as the localities do not come within the South Lushai Hills.

At Demagiri the writer met with the subdivisional officer for Lungleh, who was returning thither after having been out on tour, and in his company the remainder of the journey was made.

The four marches that intervened between Demagiri and Fort Lungleh were as follows:—

25th March	.	.	Demagiri	to Tuichong	8 miles.
26th	"	.	Tuichong	" Lungsins	10½ "
27th	"	.	Lungsins	" Ridge camp	13 "
28th	"	.	Ridge camp	" Fort Lungleh	10½ "

These were four very fatiguing marches in the hot sun and uphill the whole way practically and during the last three the writer

suffered from slight fever, and on reaching Fort Lungleh was obliged to lay up for a day or two. So practically nothing was collected on the land part of the journey to Lungleh.

The writer was most hospitably received at Fort Lungleh by Mr. C. B. Drake-Brockman, the Subdivisional officer, and Lieut. Bailey, I.S.C., assistant commandant, the only Europeans there. The writer then stayed at Fort Lungleh up to the 19th April, when circumstances compelled his return to Calcutta. The actual collecting period was thus reduced to about three weeks, of which one week was lost partly owing to very bad weather and a recurrence of the writer's fever.

Had it been possible for the excursion to have taken place earlier in the year, and had more time been available doubtless a better collection would have been got.

The return journey was unfortunate from a weather point of view. The journey from Lungsin to Tuichong was made amid torrents of rain, quite precluding any attempt at collecting. The river journey from Demagiri to Barkhal was also done under the same wretched circumstances, in addition the dug-out running against a rock and partially capsizing in shooting the Utan Chatra rapids, so that what the rain did not wet the river effectually did.

Next day the 24th April was spent at Barkhal, where the rain poured steadily down the whole day, in drying clothes and paper.

Rangamatti was reached on the 25th April, Chittagong on the 28th, and Calcutta on the 30th April.

Special thanks are due to Major Shakespeare, C.I.E., Superintendent of the Lushai Hills, for allowing access to that region and for giving facilities for obtaining coolies and supplies.

The South Lushai Hills are formed of several parallel ranges running roughly north and south between latitude  $22^{\circ}$  and  $24^{\circ}$  N and longitude  $92^{\circ}$  to  $94^{\circ}$  East. The altitude varies from about 2,000 to 4,000 feet, with a few isolated peaks reaching 7,000 feet. The valleys are very deep with exceedingly steep slopes, covered with a dense impenetrable jungle of climbing palms, creepers, bamboos, etc., amongst which tower lofty trees, the most conspicuous of which are huge Dipterocarps.

The general features of the flora are practically those of the adjacent Burmese hills. Epiphytic orchids abound, chiefly species of *Dendrobium* and form conspicuous masses of colour on the trees. Scitamineous plants and aroids are very common, and the trailing strings of *Dioscorea* fruits were very frequent. Amongst the commoner trees in addition to the Dipterocarps were *Saurauja punduana* Wall., *Schima Wallichii* Choisy, *Duabanga sonneratioides* Ham,

*Gmelina arborea Roxb.* Bamboos formed a very conspicuous feature of the jungle but none were found in flower.

Fort Lungleh itself is situated on a ridge at an elevation of 3,500 feet. In the list, when Fort Lungleh is given as the locality of collection, the altitude is not mentioned, but is to be taken as about 3 000 feet. The approximate altitude of other localities is given in most cases.

For much help in identifying the species of the collection generally the writer is specially indebted to Major Prain. The list of orchids is made up to a small extent from specimens collected by the writer, but mostly from living plants collected by Lieut. Bailey for his own study. Examples of each species in Lieut. Bailey's collection were very generously given by him to the writer, who forwarded them to Mr. Pantling of the Government Cinchona Department. The thanks of the writer are due to Mr. Pantling for kindly identifying those that were sent to him.

In the list the number within brackets, when present, after the name of each species is the field number. The sketch map at the end of the note shows the route and the position of Lungleh. For a map showing the relative position of the Lushai Hills to their surroundings the reader is referred to Pottinger and Prain's note on the Botany of the Kachin Hills, No. 11 of the Records, page 310.

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## Phanerogamia.

## DICOTYLEDONES.

*Thalamifloræ.*

## I.—RANUNCULACEÆ.

1. *Clematis grewiaeflora*. *D.C.* (No. 29).  
In fruit.  
Fort Lungleh.  
Distrib. Lower temperate, and Subtropical Himalaya; Kachin hills; Naga hills; Manipur; Burmah.

## II.—ANONACEÆ.

2. *Goniothalamus sesquipedalis*. *Hf. & T.* (No. 95).  
Leaves only.  
Helio hill, Lungleh. Alt. 3,700 feet  
Distrib. Sikkim to Assam, Khasia hills to Tenasserim.

## III.—MENISPERMACEÆ.

3. *Pericampylus incanus* *Miers* (No. 58).  
In flower.  
Fort Lungleh.  
Distrib. Kachin hills; Eastern Himalaya; Southern China; Indo-China; Malaya.
4. *Stephania rotunda* *Lour.* (No. 217).  
Fort Lungleh.  
Leaves only.  
Distrib. Tropical and Temperate Himalaya; Khasia hills; Pegu; South-West India.
5. *Lophophyllum bicristatum* *Griff.* (No. 43).  
In fruit  
Fort Lungleh.  
Distrib. Eastern Himalaya; Khasia hills; Manipur; Burmah.

## IV.—CRUCIFERÆ.

- 6 *Nasturtium indicum*, *D.C.* var. *bengalensis* (No. 215).  
Between Ridge Camp and Lungsin.  
Alt. circa 2,500 feet.  
Distrib. of variety. Bengal ; Chittagong ; Silhet ; Khasia Hills ;  
Assam.

## V.—CAPPARIDEÆ.

7. *Roydsia suaveolens* *Roxb.* (Nos. 41 and 77).  
In flower and fruit.  
Fort Lungleh.  
Distrib Sikkim ; Bhotan ; Assam ; Chittagong and Burmah.

## VI.—BIXINEÆ.

8. *Gynocardia odorata* *Roxb.* (Nos. 70 and 178).  
In fruit.  
Fort Lungleh.  
Distrib. Sikkim ; Khasia hills ; Chittagong and Burmah.
9. *Hydnocarpus* sp. (No. 71).  
Fort Lungleh

## VII.—PITTOSPOREÆ.

10. *Pittosporum floribundum* *W. & A.* (No. 103).  
In fruit.  
Helio Hill Lungleh. Alt. 3,700 feet.  
Distrib. North-Western Himalaya ; Sikkim ; Khasia Hills ;  
Burmah ; South India.

## VIII.—GUTTIFERÆ.

11. *Garcinia Xanthochymus* *Hook. f.* (No. 205).  
In fruit.  
Between Tuichong and Demagiri. Alt. circa 1,000 feet.  
Distrib Sikkim ; Khasia hills ; Burmah ; South India ;  
Ceylon ; Eastern Peninsula ; Andamans.

## IX.—TERNSTROEMIACEÆ.

- 12 *Saurauja punduana* *Wall.* (No. 51).  
In flower.  
Fort Lungleh.  
Distrib. Sikkim ; Bhotan ; Khasia hills ; Burmah.

13. *Schima Wallichii Choisy* (No 33).

In flower and fruit.

Fort Lungleh.

Distrib. North-Western Himalaya; Sikkim, Khasia hills; Assam; Chittagong and Burmah.

#### X.—DIPTEROCARPEÆ.

14. *Dipterocarpus turbinatus Gaertn.*

Huge trees of which only the fallen young fruits were collected.

#### XI.—MALVACEÆ.

15. *Abutilon polyandrum Schlecht* (No. 108).

In fruit.

Fort Lungleh.

Distrib. Tropical Himalaya; South, West, and Central India; Burmah; Java.

16. *Urena lobata Linn. var. tomentosa* (No. 60).

In fruit.

Fort Lungleh.

Distrib. General in the tropics.

17. *Hibiscus pungens Roxb.* (No. 157).

In fruit.

Fifteen miles South-East of Fort Lungleh.

Distrib. North-Western Himalaya; Nepal; Sikkim; Bhotan; Duphla hills; Naga hills; Khasia hills; Assam; Bengal Burmah.

#### XII.—STERCULIACEÆ.

18. *Sterculia colorata Roxb.* (No. 111).

In flower.

Fort Lungleh.

Distrib. India and Indo-China.

19. *Buettneria aspera Colebrooke* (No. 69).

In fruit.

Fort Lungleh.

Distrib. Nepal; Sikkim; Khasia hills; Assam; Burmah; Andamans.

20. *Buettneria pilosa Roxb.* (No. 200).

In fruit.

Between Fort Lungleh and Ridge Camp. Alt. circa 3,000 feet.

Distrib. Kachin hills; Assam; Chittagong and Burmah.

## XIII.—TILIACEÆ.

21. *Columbia floribunda* Wall. (No. 193).  
In fruit.  
Fort Lungleh.  
Distrib. Assam ; Burmah.
22. *Triumfetta pilosa* Roth. (No. 59).  
In fruit.  
Fort Lungleh.  
Distrib. India ; Indo-China ; China ; Malaya ; Africa.

*Discifloræ.*

## XIV.—MALPHIGIACEÆ.

23. *Hiptage acuminata* Wall, var. (No. 146).  
In flower and fruit.  
A tall climber.  
Fort Lungleh.  
Distrib. Khasia hills ; Naga hills ; Manipur ; Assam ;  
Burmah

## XV.—GERANIACEÆ.

24. *Oxalis corniculata* Linn. (No. 216).  
In fruit.  
Fort Lungleh.  
Distrib. Cosmopolitan.

## XVI.—RUTACEÆ.

25. *Toddalia aculeata* Pers. (Nos. 42 and 102).  
In fruit.  
Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. India ; Indo-China ; China ; Malaya.
26. *Glycosmis pentaphylla* Correa. (No. 80).  
In flower.  
Fort Lungleh.  
Distrib. North-Western Himalaya ; Sikkim ; Khasia hills ;  
Assam ; Burmah ; Andamans ; South and West India ;  
Ceylon ; Malaya Peninsula and Archipelago ; Philippines ;  
Australia.

27. *Micromelum pubescens* Bl. (Nos. 20 and 30).  
In fruit.  
Fort Lungleh.  
Distrib. Nepal ; Sikkim ; Khasia hills ; Naga hills ; Assam ;  
Chittagong and Burmah ; Malaya ; Ceylon ; Java ; China.
28. *Murray exotica* Linn. (No. 183)  
In flower.  
Fort Lungleh.  
Distrib. North-Western Himalaya ; Assam ; Chittagong and  
Burmah ; Andamans , South-West India ; Ceylon ; China ;  
Australia ; Pacific Islands.
29. *Clausena suffruticosa* W. & A. (No. 46).  
In flower.  
Fort Lungleh.  
Distrib. Khasia hills ; Chittagong and Burmah.
30. *Citrus Medica* Linn. (No. 65).  
In flower and fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. North-Western Himalaya ; Sikkim ; Khasia hills ;  
Garo hills ; Kachin hills ; Chittagong and Burmah ; Western  
Ghats ; Central India.

## XVII.—BURSERACEÆ.

31. *Garuga pinnata* Roxb. (No. 274).  
In fruit.  
Fort Lungleh.  
Distrib. Throughout India ; Assam ; Burmah ; Malaya ;  
Philippines.

## XVIII.—MELIACEÆ.

32. *Dysoxylum binectariferum* Hook f. (No. 198).  
In fruit.  
Between Lungleh and Ridge Camp. Alt circa 3,000 feet.  
Distrib. Sikkim ; Khasia hills ; Assam ; Chittagong and  
Burmah ; South India ; Ceylon ; Malacca ; Java.
33. *Dysoxylum procerum* Hiern. (No. 177).  
In fruit. Fort Lungleh.  
Distrib. Sikkim ; Bhotan ; Khasia hills ; Assam ; Chittagong  
and Burmah.
34. *Chisocheton paniculatus* Hiern. (No. 203).  
In fruit. Fort Lungleh.  
Distrib. Sikkim ; Cachar ; Khasia hills ; Assam ; Chittagong  
and Burmah.

35. *Aglaia Chittagonga* *Miq.* (No. 161).  
In fruit. Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Khasia hills; Duphla hills; Akha hills; Chittagong; Burmah.

#### XIX.—CELASTRINEÆ.

36. *Microtropis discolor* *Wall.* (No. 159).  
In fruit. Fifteen miles South-East of Fort Lungleh.  
Distrib. North-West Himalayas; Sikkim; Khasia hills; Assam; Manipur; Kachin hills; Burmah.
37. *Celastrus monosperma* *Roxb.* (Nos. 16 and 147).  
In fruit. Fort Lungleh.  
Distrib. Sikkim; Khasia hills; Naga hills; Burmah.
38. *Gymnosporia acuminata* *Hook. f.* (No. 40).  
In fruit. Fort Lungleh.  
Distrib. Sikkim; Khasia hills; Eastern Peninsula; Burmah; Yunnan

#### XX.—AMPELIDEÆ.

39. *Vitis adnata* *Wall.* (No. 220).  
In fruit. Demagiri. Alt. circa 500 feet.  
Distrib. North-Western Himalaya; Sikkim; Khasia hills; Cachar; Assam; Chittagong and Burmah; S. India; Malay Peninsula.
40. *Vitis angustifolia* *Wall.* (No. 221).  
In fruit. Fort Lungleh.  
Distrib. Khasia hills; Kachin hills; Silhet; Assam; Sumatra; Hong Kong.
41. *Vitis capriolata* *Don* (No. 104).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. North-Western Himalaya; Sikkim; Khasia Hills; Assam; Kachin hills; Chittagong and Burmah.
42. *Vitis lanceolaria* *Wall.* (No. 8).  
In fruit. Fort Lungleh.  
Distrib. North-Western Himalaya; Nepal; Sikkim; Khasia hills; Assam; Chittagong and Burmah; Andamans; South and West India; Ceylon; Malaya; Java.
43. *Vitis Japonica* *Thunb.* (No. 219).  
In flower. Demagiri. Alt 500 feet.  
Distrib. Sikkim; Khasia Hills; Naga hills; Manipur; Assam; Chittagong and Burmah; Nicobars; Andamans; South India; Malaya; Java; China.

44. *Leea sambucina Willd.* (No. 85).

In fruit. Fort Lungleh.

Distrib. Common throughout India and Burmah; Ceylon; Malaya; China; Philippines; Australia.

#### XXI.—SAPINDACEÆ.

45. *Acer* sp. (No. 138).

In fruit. Fifteen miles S. E. of Lungleh.

Not matched in Herb. Calcutta. Nearest *Acer isolobum Kurz* but quite distinct.

46. *Turpinia pomifera D.C.* (No. 255).

In fruit. Fort Lungleh.

Distrib. Nepal; Sikkim; Khasia hills; Naga hills; Assam; Kachin hills; Chittagong and Burmah; South and West India, Malaya; Yunnan; China.

#### *Calycifloræ.*

#### XXII.—CONNARACEÆ.

47. *Connarus paniculatus Roxb.* (No. 27).

In fruit. Fort Lungleh.

Distrib. Khasia; Silhet; Assam; Chittagong; Burmah.

#### XXIII —LEGUMINOSÆ.

48. *Crotalaria ferruginea Grah.* (No. 92).

In fruit. Helio hill; Lungleh. 3,700 feet.

Distrib. Nepal; Sikkim; Khasia hills; Naga hills; Kachin hills; Chittagong and Burmah; Ceylon; Java; Sumatra; Philippines; Formosa.

49. *Desmodium gangeticum D C.* (No. 224).

In fruit. Fort Lungleh.

Distrib. Universal in the tropics.

50. *Erythrina stricta Roxb.* (No. 112).

In flower and fruit. Fort Lungleh.

Distrib. India from Rajputana to Orissa; Assam; Burmah and Chittagong.

51. *Mucuna imbricata D.C.* (No. 225).

In flower. Fort Lungleh.

Distrib. North-Western Himalaya; Sikkim; Silhet; Assam; Manipur; Burmah; Andamans.

52. *Dunbaria podocarpa* Kurz. (No. 192).  
In flower and fruit. Fort Lungleh.  
Distrib. Burmah.
53. *Flemingia stricta* Roxb. (No. 227).  
In fruit. Fort Lungleh.  
Distrib. North-Western Himalaya; Sikkim; Oude; South and Central India; Assam; Chittagong and Burmah.
54. *Dalbergia volubilis* Roxb. (No. 196).  
In fruit. Fort Lungleh.  
Distrib. Sikkim Terai; Assam; Chittagong and Burmah; Andamans; Oude; Bihar; Central, South, and West India.
55. *Derris monticola* Prain. (No. 23).  
In flower. Fort Lungleh.  
Is *Milletia monticola* Kurz.  
Distrib. Burmah.
56. *Derris thyrsoflora* Bth. (No. 32).  
In flower. Fort Lungleh.  
Distrib. Eastern Himalaya; Khasia Hills; Malaya.
57. *Cassia timorensis* D.C. (No. 226).  
In fruit. Fort Lungleh.  
Distrib. Chittagong and Burmah; Malaya; Western India; Ceylon; Philippines; Australia.
58. *Bauhinia rufa* Grah. (No. 136).  
In fruit. Fifteen miles S. E. of Lungleh.  
Distrib. Assam; Burmah.
59. *Bauhinia glauca* Wall.  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Burma; Malaya; China.  
A decided northward extension of this species.
60. *Saraca indica* Linn. (No. 213).  
In flower. Between Ridge Camp and Lungsin. Alt. 2,000—2,500 feet.  
Distrib. Central and Eastern Himalaya; Khasia hills; Assam; Chittagong and Burmah; South and West India; Ceylon; Malaya.
61. *Entada Pursætha* D.C. (No. 90).  
*Entada scandens* of the Flora of British India.  
In flower. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Nepal; Sikkim; Khasia hills; Naga hills; Manipur; Assam; Chittagong and Burmah; Andamans; Malaya; South and West India; Ceylon.

62. *Acacia Intsia Willd.* (No. 79). Var. *oxyphylla*. In fruit Fort Lungleh.  
Distrib. Tropical Himalaya; South and West India; Assam; Chittagong and Burmah; Malaya; Ceylon.
63. *Acacia pennata Willd.* var. *arrophula* (No. 106).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Chittagong and Burmah; Andamans; Malaya; Central India.
64. *Acacia pruinescens Kurz.* (No. 121).  
In fruit. Fort Lungleh.  
Distrib. Kachin hills; Upper Assam.
65. *Albizzia stipulata Boiv.* (No. 124).  
In flower. Fort Lungleh.  
Distrib. North-West Himalaya; Nepal; Sikkim; Khasia hills; Naga hills; Chittagong and Burmah; Andamans; South and West India; Ceylon; Malaya; Borneo; Java.

## XXIV.—ROSACEÆ.

66. *Rubus moluccanus Linn.* (No. 21).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Chin hills; South and West India and Ceylon; Manipur; Burmah; Malaya.
67. *Rubus ellipticus Smith* (No. 62).  
In fruit. Fort Lungleh.  
Distrib. North-West Himalaya; Nepal; Sikkim; Khasia hills; Kachin hills; Manipur; Assam; Burmah; Yunnan; South-West India; Ceylon.
68. *Rubus lasiocarpus Smith* (No. 58).  
In flower. Fort Lungleh.  
Distrib. North-West Himalaya; Sikkim; Naga hills; Assam; Chin hills; Burmah; South and West India; Ceylon; Java.
69. *Rubus rosæfolius Smith* (Nos. 30 and 51).  
In fruit. Fort Lungleh.  
Distrib. North-West Himalaya; Sikkim; Khasia hills; Naga hills; Assam; Burmah; Java.
70. *Eriobotrya bengalensis Hook. f.* (No. 155).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Sikkim; Khasia hills; Manipur; Chittagong and Burmah; Malacca.

## XXV.—RHIZOPHOREÆ.

71. *Caralia integerrima* DC. (No. 57).  
 In flower. Fort Lungleh.  
 Distrib. Sikkim Terai; Bengal; Silhet; Cachar; Khasia hills; Manipur; Assam; Chittagong and Burmah; Andamans; South-West India; Ceylon; Malaya.

## XXVI.—COMBRETACEÆ.

72. *Calycopteris floribunda* Lamk. (No.—).  
 In fruit. Demagiri. Alt. 500 feet.  
 Distrib. Assam; Chittagong and Burma; Andamans; South and West India; Malaya.
73. *Anogeissus acuminata* Wall. (No. 109) var. *lanceolata*.  
 In fruit. Fort Lungleh.  
 Distrib. Chittagong and Burmah.
74. *Combretum squamosum* Roxb. (Nos. 110 and 111).  
 In fruit. Fort Lungleh.  
 Distrib. Nepal; Sikkim; Khasia hills; Assam; Chittagong and Burmah; Malay; Philippines.
75. *Combretum dasystachyum* Kurz (No. 187).  
 In flower. Fort Lungleh.  
 Distrib. Khasia hills; Cachar; Silhet; Chittagong and Burmah.

## XXVII.—MYRTACEÆ.

76. *Eugenia polypetala* Wight. (No.—).  
 In flower. Demagiri. Alt. 500 feet.  
 Distrib.

## XXVIII.—MELASTOMACEÆ.

77. *Melastoma normale* Don. (No. 73).  
 In flower. Fort Lungleh.  
 Distrib. Nepal; Sikkim; Bhotan; Khasia hills; Naga hills; Kachin hills; Burmah; Indo-China.
78. *Sonerila maculata* Roxb. No. 259).  
 Leaf specimen. Fort Lungleh.  
 Distrib. Nepal; Khasia hills; Assam; Kachin hills; Burmah
79. *Medinilla rubicunda* El. (No. 25).  
 In fruit. Fort Lungleh.  
 Distrib. Sikkim; Khasia hills; Assam; Malaya.

## XXIX.—LYTHRACEÆ.

80. *Duabunga sonneratoides* *Ham.* (No. 72).  
In flower and fruit. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Chittagong  
and Burmah; Andamans; Malaya.

## XXX.—CUCURBITACCÆ

81. *Hodgsonia heteroclita* *Hook. f.* (No. 101).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Sikkim; Khasia hills; Assam; Chittagong and  
Burmah; Malaya.
82. *Thladiantha calcarata* *C. B. Clarke* (No. 210).  
In flower. Between Ridge camp and Lungsing. Alt. 2,000 feet.  
Distrib. Sikkim; Khasia hills; Assam; Chittagong and  
Burmah; Malaya; China.

## XXXI.—BEGONIACEÆ.

83. *Begonia barbata* *Wall.* (Nos. 232 and 233).  
In flower and fruit. Fort Lungleh.  
Distrib. Assam; Burmah; Chittagong.

## XXXII.—UMBELLIFERÆ.

84. *Hydrocotyle javanica* *Thunb.* (No. 234).  
In fruit. Between Tuichong and Demagiri. Alt. 500-1,000  
feet.  
Distrib. Throughout South-Eastern Asia and in Eastern  
Africa.

## XXXIII.—ARALIACEÆ.

85. *Heptapleurum venulosum* *Seem* (No. 175), var. *macrophylla*.  
In fruit. Fort Lungleh.  
Distrib. Throughout tropical and subtropical India; Malaya;  
Australia.
86. *Trevesia palmata* *Vis.* (No. 222).  
In fruit. Demagiri. Alt. 500 feet.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Chittagong  
and Burmah; Malaya.
87. *Brassaiopsis speciosa* *Decne. and Planch.* (No. 156).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Naga hills; Assam;  
Chittagong and Burmah; Java.

*Corollifloræ.*

## XXXIV.—RUBIACEÆ.

88. *Uncaria sessilifructus Roxb.* (Nos. 18 and 223).  
In fruit. Fort Lungleh.  
Distrib. Nepal; Sikkim; Bhotan; Khasia hills; Assam;  
Kachin hills; Chittagong and Burmah; Indo-China.
89. *Uncaria homomalla Miq.* (No. 28).  
In flower. Fort Lungleh.  
Distrib. Khasia hills; Sumatra.
90. *Wendlandia glabrata D.C.* (No. 34).  
In flower. Fort Lungleh.  
Distrib. Khasia hills; Naga hills; Manipur; Burmah;  
Yunnan; South India; Malaya; Formosa.
91. *Hedyotis scandens Roxb.* (No. 48).  
In fruit. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Akha hills; Kachin  
hills; Chittagong.
92. *Ophiorrhiza Harrissiana Heyne*, var. *argentea*. (No. 188).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Silhet; Kachin hills  
Chittagong; South and West India; Ceylon.
93. *Mussaenda glabra Vahl.* (No. 186).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Manipur; Cachar  
Assam; Chittagong and Burmah; Malaya.
94. *Mussaenda macrophylla Wall.* (No. 277).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia; Burma; Andamans; Malaya.
95. *Adenosacme longifolia Wall.* (No. 150).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. North-Western Himalaya; Sikkim; Khasia hills;  
Duphla hills; Cachar; Manipur; Chittagong and Burmah;  
Malaya.
96. *Randia longiflora Lamk.* (No. 235).  
In flower. Between Ridge camp and Lungsin. Alt. circa  
2,500 feet.  
Distrib. Khasia hills; Silhet; Assam; Chittagong and Burmah;  
Andamans; Malaya.
97. *Ixora subsessilis Wall.* (No. 145).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Assam; Khasia hills; Naga hills; Manipur.

98. *Ixora villosa Roxb.* (No. 236).  
In flower. Fort Lungleh.  
Distrib. Sikkim; Khasia hills; Silhet; Cachar; Assam;  
Burmah; Malaya.
99. *Pavetta indica Linn.* (Nos. 82 and 176).  
In flower. Fort Lungleh.  
Distrib. Throughout India, Ceylon and Malaya; South  
China; North Australia.
100. *Morinda angustifolia Roxb.* (No. 39).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Chittagong  
and Burmah.
101. *Psychotria calocarpa Kurz* (No. 169).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Cachar; Assam;  
Kachin hills; Chittagong and Burmah.

## XXXV.—COMPOSITÆ.

102. *Vernonia blanda D.C.* (No. 13).  
In fruit. Fort Lungleh.  
Distrib. Khasia hills; Manipur; Burmah.
103. *Ageratum conyzoides Linn.* (No. 165).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Throughout India.
104. *Conyza stricta Willd.* (No. 88).  
In flower. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. North-Western Himalaya; Sikkim; Khasia hills;  
Assam; Chittagong and Burmah; South and Western  
India; East Africa.
105. *Blumea lacera D.C.* (No. 89).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Throughout India and Ceylon; Malaya; China;  
Tropical Africa.
106. *Blumea densiflora D.C.* (No. 98).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Sikkim; Khasia hills; Naga hills; Duphla hills  
Burmah; Yunnan and Malaya.
107. *Blumea balsamifera D.C.* (No.—).  
In flower. Bank of Karnaphuli river. Alt. 500 feet.  
Distrib. Nepal; Sikkim; Khasia hills; Kachin hills;  
Assam; Burmah; China; Indo-China; Malaya.

108. *Laggera pterodonta* Bth. (No. 151).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. North-Western Himalaya; Sikkim; Khasia hills;  
Manipur; Burmah; South and Western India; Tropical  
Africa.
109. *Gnaphalium luteo-album* Linn. (No. —).  
In flower. Fifteen miles South-East of Lungleh.  
Distrib. Throughout the tropics.
110. *Siegesbeckia orientalis* Linn. (No. 162).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Cosmopolitan in the tropics.
111. *Bidens pilosa* Linn. (No. 86).  
In flower. Helio hill, near Lungleh. Alt. 3,700 feet.  
Distrib. General throughout the tropics.

#### XXXVI.—CAMPANULACEÆ.

112. *Campanumœa celebica* Blume (No. 202).  
In flower and fruit. Between Lungleh and Ridge camp.  
Alt. 3,000 feet.  
Distrib. Sikkim; Chittagong; Burmah and Malaya.

#### XXXVII.—MYRSINÆ.

113. *Maesa indica* Wall. (No. 2).  
In flower and fruit. Fort Lungleh.  
Distrib. Throughout India and Ceylon; Malaya; South  
China.
114. *Maesa paniculata* A D.C. (No. 22).  
In flower. Fort Lungleh.  
Distrib. Silhet; Assam; Burmah.
115. *Myrsine semi-serrata* Wall. (No. 93).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. North-Western Himalaya; Nepal; Sikkim;  
Khasia hills; Manipur; Burmah.
116. *Embelia Ribes* Burm. (No. 122).  
In fruit. Fort Lungleh.  
Distrib. Throughout India and Ceylon, Malaya; South  
China.
117. *Ardisia paniculata* Roxb. (No. 66).  
In flower. Demagiri. Alt. 1,000 feet.  
Distrib. Khasia hills; Assam; Chittagong.

118. *Ardisia colorate* Roxb. (No. 237).  
 In fruit. Between Ridge camp and Lungsin. Alt. 2,500 feet.  
 Distrib. Assam; Cachar; Chittagong; Burmah and Malaya.
119. *Antistrophe oxyantha* A.D.C. (No. 143).  
 In fruit. Fifteen miles South-East of Lungleh.  
 Distrib. Sikkim; Khasia hills; Garo hills and Silhet.

## XXXVIII.—STYRACEÆ.

120. *Symplocos* sp. near Hookerl, C. B. C. (No. 239).  
 In fruit. Fifteen miles South-East of Lungleh.  
 Distrib. Collected by Gallatly in Tenasserim in 1877.
121. *Styrax serrulatum* Roxb. Var. *agrestis*. (No. 238).  
 In bud. Fifteen miles South-East of Lungleh  
 Distrib. Sikkim; Khasia hills; Chittagong; Burmah;  
 South India.

## XXXIX.—OLEACEÆ.

122. *Jasminum coarctatum* Roxb. (No. 275).  
 In flower. Fort Lungleh.  
 Distrib. Khasia hills; Diphla hills; Assam; Chittagong;  
 Burmah.
123. *Jasminum anastomosans* Wall. (No. 49).  
 In flower. Fort Lungleh  
 Distrib. Bhotan; Khasia hills; Naga hills; Cachar; Silhet;  
 Manipur; Kachin hills; Burmah.
124. *Jasminum Listeri* King. *Ms. in Herb. Calc.* (No. 78).  
 In flower. Fort Lungleh.  
 Collected by Lister in Chittagong hill tracts in 1876.  
 Scandent shrub, branches pale brown glabrous, branchlets faintly pubescent. Leaves opposite, simple, petiole  $\frac{1}{4}$ ", lamina 3" to 5" by  $1\frac{1}{4}$ ", lanceolate acuminate, base cuneate, glabrous above, faintly pubescent on nerves beneath, main nerves 4 to 5, prominent beneath. Cymes rather lax, axillary, capitate, pubescent, much shorter than the leaves, 5 or 6 flowers in each cyme. Peduncle  $\frac{5}{8}$ ", pedicels  $\frac{1}{8}$ ". Bracts subulate, minute, 2 to 3 pairs, pedicels and calyx slightly villose, calyx teeth subulate, faintly villous  $\frac{3}{8}$ " corolla white, lobes six, tube  $\frac{5}{8}$ ", lobes  $\frac{7}{8}$ ", Stamens two, in the throat of the corolla, on very short filaments, anthers oblong, aristate. Ovary 2-celled, style cylindric, stigma, bifid, lobes linear, ovules 2 in each cell.

This is a very distinct and pretty species, and would appear to come between *Jasminum undulatum* Ker and *J. pubescens* Willd. of the Flora of British India.

125. *Ligustrum robustum* Bl. (No. 99).

In fruit. Helio hill, Lungleh. Alt. 3,700 feet.

Distrib. Sikkim; Khasia hills; Chittagong; Burmah; Malaya.

#### XL.—APOCYNACEÆ.

126. *Melodinus monogynus* Roxb. (No. 240).

In flower. Fort Lungleh.

Distrib. Sikkim; Khasia hills; Duphla hills; Silhet; Assam; Malaya.

127. *Melodinus* sp. (Nos. 17 and 154).

In fruit. Fort Lungleh.

Not matched in Herb. Calc.

128. *Tabernæmontana coronaria* Br. (No. 199).

In flower. Between Lungleh and Ridge camp. Alt. 3,000 feet.

Distrib. Throughout India.

129. *Anodendron paniculatum* A. D. C. (Nos. 81 and 97).

In flower and fruit. Fort Lungleh.

Distrib. Khasia hills; Duphla hills; Silhet; Chittagong; Burmah; South and West India; Ceylon; Java; Philippines.

#### XLI.—ASCIPIADACEÆ.

130. *Gymnema* sp. (No. 74).

In flower. Fort Lungleh.

Not matched in Herb. Calc.

#### XLII.—LOGANIACEÆ.

131. *Buddleia asiatica* Lour. (No. —).

Common everywhere.

Distrib. Throughout India; Malaya; Indo-China; China.

#### XLIII.—BORAGINÆÆ.

132. *Ehretia Wallichiana* Hook. f. and T. (Nos. 84 and 184).

In flower and fruit. Fort Lungleh.

Distrib. Sikkim; Bhotan; Assam; Khasia hills.

133. *Tournefortia Roxburghii* C. B. Clarke (No. 181).  
In fruit. Fort Lungleh.  
Distrib. Chittagong hill tracts.
134. *Heliotropium indicum* Linn. (No. —).  
Common. In flower and fruit.  
Distrib. Throughout India; Malaya; East Asia; Tropical Africa; Tropical America.

## XLIV.—CONVOLVULACEÆ.

135. *Ipomœa kingii* Prain. (No. 76).  
In flower and fruit. Fort Lungleh.  
Distrib. Sikkim; Bhotan; Khasia; Assam; Burmah.
136. *Ipomœa vitifolia* Sweet. (No. 241).  
In fruit. Demagiri. Alt. 1,000 feet.  
Distrib. Throughout India; Ceylon and Malaya.

## XLV.—SOLANACEÆ.

137. *Solanum torvum* Swartz (No. 242).  
In flower. Fort Lungleh.  
Distrib. Throughout India; Indo-China; China; Malaya; Tropical America.
138. *Solanum indicum* Linn. (No. 91).  
In fruit. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Throughout India; Indo-China; Malaya.
139. *Datura fastuosa* Linn. (No. 1).  
In flower. Fort Lungleh.  
Distrib. Throughout India; Malaya; Tropical Africa.
140. *Nicotiana Tabacum* Linn. (No. —).  
Common. In flower. Throughout India.

## XLVI.—SCROPHULARINEÆ.

141. *Mazus rugosus* Lour. (No. 164).  
In flower. Fort Lungleh.  
Distrib. Afghanistan; North-West Himalaya; Sikkim; Bhotan; Khasia hills; Assam; Chittagong; Burmah; Malaya; China; Japan; Philippines.

142. *Lindenbergia philippensis Benth.* (No. 244).  
In fruit. Demagiri. Alt. 1,000 feet.  
Distrib. Naga hills; Shan hills; Chittagong; Burmah;  
Indo-China; China.
143. *Torenia vagans Roxb.* (No. 243).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Kachin  
hills; Chittagong.

## XLVII.—GESNERACEÆ.

144. *Aeschynanthus* sp. (No. 130).  
In fruit. Sect. *Haplotrichium*.  
Fifteen miles South-East of Lungleh. Not matched in Herb.  
Calc.

## XLVIII.—BIGNONIACEÆ.

145. *Oroxylum indicum Vent.* (No. —).  
Only fruit gathered. Fort Lungleh.  
Distrib. Throughout India; Indo-China; Malaya.
- 146 *Stereospermum glandulosum Mig.* (No. 153).  
In flower and young fruit. Fifteen miles South-East of  
Lungleh.  
Distrib. Burmah; Malaya.

## XLIX.—ACANTHACEÆ

147. *Thunbergia grandiflora Roxb.* (No. 211).  
In flower. Between Ridge camp and Lungsins. Alt. 2,500  
feet.  
Distrib. East Bengal; Assam; Manipur; Kachin hills; Chit-  
tagong hill tracts.
148. *Hemigraphis hirta T. And.* (No. 251).  
In flower and fruit. Fort Lungleh.  
Distrib. North-Western Provinces; Bengal; Central Prov-  
inces; Pegu.
149. *Acanthus leucostachyus Wall.* (No. 141).  
In flower. Fifteen miles South-East of Lungleh.  
Distrib. Khasia hills; Duphla hills; Cachar; Manipur;  
Kachin hills; Chittagong hill tracts.

150. *Eranthemum album* *Nees* (No. 64).  
In flower. Fort Lungleh.  
Distrib. Jaboca Naga hills; Assam; Chittagong; Burmah;  
Andamans; Nicobars.
151. *Phlogacanthus tubiflorus* *Nees* (No. 6).  
In fruit. Fort Lungleh.  
Distrib. Khasia hills; Duphla hills; Manipur; Kachin hills.
152. *Phlogacanthus guttatus* *Nees* (No. 190).  
In fruit. Fort Lungleh.  
Distrib. Khasia hills; Jaboca Naga hills; Chittagong hill  
tracts.
153. *Lepidagathis hyalina* *Nees* (No. 250).  
In fruit. Demagiri. Alt. 1,000 feet  
Distrib. Throughout North India; Assam; Chittagong;  
Burmah; Indo-China; China.
154. *Rhinacanthus calcaratus* *Nees* (No. 11).  
In flower. Fort Lungleh.  
Distrib. Khasia hills; Cachar; Chittagong hill tracts.
155. *Rungia parviflora* *Nees* var. *muralis*. (No. 134).  
In flower. Fifteen miles South-East of Lungleh.  
Distrib. of the variety. South India; Chittagong hill tracts.
156. *Dicliptera Roxburghiana* *Nees* var. *linearis* *Kurz* in Herb.  
Calc. (No. 135).  
In flower. Fifteen miles South-East of Lungleh.  
Collected by *Kurz* in Pegu.
157. *Peristrophe tera* *C. B. Clarke*. (No. —).  
In flower. Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Bhotan; Assam; Khasia.

#### L.—VERBENACEÆ.

158. *Gmelina arborea* *Roxb.* (No. 248).  
In flower. Fort Lungleh.  
Distrib. South-Eastern Asia.
159. *Clerodendron infortunatum* *Gärtn.* (No. 107).  
In flower and fruit. Fort Lungleh.  
Distrib. India; Indo-China; Malaya.
160. *Caryopteris paniculata* *C. B. Clarke*. (No. 148).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Nepal; Sikkim; Mishmi hills; Kachin hills;  
Upper Burmah; Yunnan.

## LI.—LABIATÆ.

161. *Pogostemon parviflorus* *Bth.* (No. 10).  
 In fruit. Fort Lungleh.  
 Distrib. North-West Himalaya ; Sikkim ; Bhotan ; Khasia hills ; Silhet ; Assam ; Chittagong ; Burmah ; Andamans ; South and West India.
162. *Pogostemon glaber* *Bth.* (No. 247).  
 In fruit. Fifteen miles South-East of Lungleh.  
 Distrib. Nepal ; Sikkim ; Khasia hills ; Kachin hills ; Upper Burmah.
163. *Pogostemon fraternus* *Miq.* (No. 245).  
 In fruit. Fort Lungleh.  
 Distrib. Sikkim ; Khasia hills ; Naga hills ; Manipur ; Upper Burmah ; Java.
164. *Ajuga macrosperma* *Wall.* var. *typica.* (No. 246).  
 In flower. Fort Lungleh.  
 Distrib. of the variety. Khasia hills ; Naga hills ; Assam ; Chittagong and Burmah.

## LII.—PLANTAGINÆ.

165. *Plantago major* *Linn.* (No. 63).  
 In fruit. Fort Lungleh.  
 Distrib. Throughout India in hilly regions ; Ceylon ; Malaya ; Afghanistan and westwards.

*Incompletæ.*

## LIII.—AMARANTACEÆ.

166. *Amarantus viridis* *Linn.* (No. 268).  
 In flower. Fort Lungleh.  
 Distrib. Throughout tropical countries.
167. *Aerua scandens* *Wall.* (No. 137).  
 In fruit. Fifteen miles South-East of Lungleh.  
 Distrib. Throughout the tropics of the Old World.

## LIV.—POLYGONACEÆ.

168. *Polygonum alatum* *Ham.* (No. 163).  
 In fruit. Fifteen miles South-East of Lungleh.  
 Distrib. India ; Indo-China ; Japan ; Abyssinia.

169. *Polygonum chinense* *Linn.* (No.—).  
In fruit. Fort Lungleh.  
Distrib. South-Eastern Asia.

#### LV.—ARISTOLOCHIACEÆ.

170. *Aristolochia* sp. (No. 24).  
In flower.  
Like Wall. cat. 2705 D in Herb. Calc. but with tomentose veins.  
Near Fort Lungleh.

#### LVI.—PIPERACEÆ.

171. *Piper peepuloides* *Roxb.* (No. 94).  
In flower. Fifteen miles South-East of Lungleh.  
Distrib. Nepal; Sikkim; Bhotan; Assam; Silhet; Khasia hills; Chittagong.  
172. *Piper boehmeriæfolium* *Wall.* (No. 47).  
In flower. Fort Lungleh.  
Distrib. Sikkim; Bhotan; Assam; Silhet; Khasia hills; Burmah.

#### LVII.—MYRISTICÆÆ.

173. *Myristica longifolia* *Wall.* (Nos. 114 and 152).  
In fruit. Near Lungleh.  
Distrib. Sikkim; Assam; Silhet; Khasia hills; Chittagong; Burmah.

#### LVIII.—LAURINEÆ.

174. *Beilschmiedia assamica* *Meisn.* (No. 171).  
In fruit. Fifteen miles South-East of Lungleh.  
Distrib. Sikkim; Khasia hills; Manipur; Assam.  
175. *Cinnamomum Tamala* *Fr. Nees* (No. 47).  
In flower and fruit. Fort Lungleh.  
Distrib. Tropical and Sub-Tropical Himalaya; Silhet; Khasia; Assam.  
176. *Litsæa Salicifolia* *Hook. f.* (Nos. 3 and 12) var. *attenuata*.  
In flower. Fort Lungleh.  
Distrib. of the variety. Silhet; Assam.  
177. *Alseodaphne petiolaris*. *Hook. f.* (No. 75).  
In fruit. Fort Lungleh.  
Distrib. Assam; Cachar; Burmah.

## LIX.—ELEAGNACEÆ.

178. *Elæagnus latifolia* *Linn.* (No. 37).

In fruit. Fort Lungleh.

Distrib. North-West Himalaya; Sikkim; Bhotan; Mishmi hills; Khasia hills; Chittagong; Burmah; South India; Ceylon; Malaya; Indo-China; China.

## LX.—EUPHORBIACEÆ.

179. *Euphorbia pilulifera* *Linn.* (No. 257).

In fruit and flower. Fort Lungleh.

Distrib. Throughout the tropics.

180. *Bridelia stipularis* *Bl.* (No. 105).

In fruit. Fort Lungleh.

Distrib. Throughout India; Ceylon; Malaya; Philippines  
Tropical Africa.

181. *Phyllanthus reticulatus* *Poir.* (No. 191).

In flower. Fort Lungleh.

Distrib. Throughout India and Ceylon; Malaya; China;  
Tropical Africa.

182. *Breynia patens* *Benth.* (No. 276).

Female in flower and fruit. Lungleh and Lungsins. Alt. 2,000 to 3,000 feet.

Distrib. Nepal; Sikkim; Mishmi hills; Khasia hills; Silhet; Manipur; Chittagong; Burmah; South India; Ceylon.

183. *Cyclostemon assamicus* *Hook. f.* (No. 182).

In fruit. Fort Lungleh.

Distrib. North-West Himalaya; Sikkim; Khasia hills; Assam; Sunderbuns; Chittagong; Arracan; Andamans.

184. *Aporosa oblonga* *Muell. Arg.* (No. 194).

In fruit. Fort Lungleh.

Distrib. Burmah; Chittagong.

185. *Baccaurea sapida* *Muell. Arg.* (No. 116).

In flower. Fort Lungleh.

Distrib. Sikkim; Silhet; Khasia hills; Assam; Burmah; Andamans; Malaya.

186. *Antidesma Bunius* *Spreng.* (No. 170).

In fruit. Fifteen miles South-East of Lungleh.

Distrib. Throughout India and Malaya.

187. *Croton oblongifolius Roxb.* (No. 38).  
In fruit. Fort Lungleh.  
Distrib. India ; Assam ; Burmah.
188. *Alchornea rugosa Muell. Arg.* (No. 128).  
In flower. Fifteen miles South-East of Lungleh.  
Distrib. Burmah ; Andamans ; Malaya ; China.
189. *Mallotus Roxburghiana Muell. Arg.* (No. 260).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Khasia hills ; Silhet ; Manipur ; Assam ;  
Chittagong ; Burmah.
190. *Ricinus communis Linn.* (No. 125).  
In fruit. Fort Lungleh.  
Distrib. Throughout the tropics.
191. *Homonoia riparia Lour.* (No. 258).  
In flower. Demagiri. Alt. 200 feet.  
Distrib. India , Indo-China ; Malaya ; China.
192. *Sapium insigne Bth.* (No. 35).  
In fruit. Fort Lungleh.  
Distrib. North-West Himalaya ; Nepal ; East Himalaya ;  
Chittagong ; Burmah.

## LXI.—URTICACEÆ.

193. *Ficus subulata Bl.* (Nos. 212 and 254).  
Between Ridge Camp and Lungsin. Alt. 2,000 feet.  
Distrib. From Chittagong southwards to the Malayan  
Archipelago ; China.
194. *Ficus urophylla Walt.* (No. 14).  
Fort Lungleh.  
Distrib. Assam ; Khasia ; Chittagong ; Burmah ; Malaya.
195. *Ficus retusa Linn. var. nitida Thunb.* (No. 123).  
Fort Lungleh.  
Distrib. of the variety. Eastern Himalaya ; Assam ; Khasia  
hills ; Burmah ; Malaya.
196. *Ficus hispida Linn. f.* (No. 253).  
Banks of the Karnaphuli river. Alt. 100-200 feet.  
Distrib. Throughout India ; Malaya ; Hong Kong ;  
Australia.

197. *Ficus cunia* *Ham.* (No. 197).  
Between Lungleh and Ridge Camp. Alt. 3,000 feet.  
Distrib. Sub-Himalayan forests; Central India; Assam;  
Khasia; Chittagong; Burmah; Malaya.
198. *Ficus hirta* *Vahl.* (No. 142).  
Fifteen miles South-East of Lungleh.  
Distrib. Eastern Himalaya; Assam; Burmah; Malaya;  
China.
199. *Ficus pomifera* *Wall.* (No. 129).  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Sikkim; Assam; Chittagong; Burmah; Malaya.
200. *Allæanthus Kurzii* *Hook. f.* (No. 53).  
Male flowers. Fort Lungleh.  
Distrib. Assam and Burmah.
201. *Cudrania fruticosa* *Wight ex. Kurz* For. Flor. (No. 19).  
In fruit. Fort Lungleh.  
Distrib. Khasia hills; Kachin hills; Chittagong; Burmah.
202. *Artocarpus Lakoocha* *Roxb.* (No. 201).  
Between Lungleh and Ridge Camp. Alt. 2,000-3,000 feet.  
Distrib. Tropical Himalaya; Burmah; South India; Malaya
203. *Conocephalus suaveolens* *Bl.* (No. 256).  
In flower. Fort Lungleh.  
Distrib. Sikkim; Khasia hills; Kachin hills; Assam;  
Burmah; Malaya.
204. *Girardinia heterophylla* *Dene.* (Nos. 5 and 7).  
In fruit. Fort Lungleh.  
Distrib. North-West Himalaya; Sikkim; Assam; Silhet;  
Burmah; Central and South India; Ceylon; Java.
205. *Elatostema sesquifolium* *Hassk.* (No. 55).  
In flower. Fort Lungleh.  
Distrib. Khasia hills; Assam; Chittagong; Burmah;  
Andamans; Nicobars; Java.
206. *Bœhmeria malabarica* *Wedd.* (Nos. 4 and 54).  
In flower. Fort Lungleh.  
Distrib. Sikkim; Mishmi hills; Khasia hills; Chittagong;  
Burmah; South and West India; Ceylon; Java.
207. *Sarcochlamys pulcherrima* *Gaud.* (No. 131).  
Leaf specimens only. Fifteen miles South-East of Lungleh.  
Distrib. North-West Himalaya; Bhotan; Assam; Khasia  
hills; Silhet; Cachar; Chittagong; Burmah.

## LXII.—GNETACCÆ

208. *Gnetum Gnemon* *Linn.* (Nos. 269 and 270).

In flower and fruit. Fort Lungleh.

Distrib. Khasia hills; Kachin hills; Manipur; Malaya.

## MONOCOTYLEDONES.

## LXIII.—ORCHIDACEÆ.

Nearly all the species of orchids in the following list were contributed by Lieut. Bailey from his collection, and consequently bear no field number. All were collected in the Fort Lungleh district, but the exact localities and altitudes had not been noted :—

209. *Oberonia iridifolia* *Lindl.*  
Distrib. India; Indo-China.
210. *Liparis longipes* *Lindl.*  
Distrib. India; Indo-China; China; Malaya.
211. *Dendrobium cariniferum* *Reichb. f.*  
Distrib. Naga hills; Manipur; Shan hills; Kachin hills.
212. *Dendrobium formosum* *Roxb.*  
Distrib. Nepal; Sikkim; Bhotan; Khasia hills; Assam  
Burmah; Andamans.
213. *Dendrobium anceps* *Swartz.*  
Distrib. Sikkim; Bengal; Assam; Burmah.
214. *Dendrobium bicameratum* *Lindl.*  
Distrib. Sikkim; Khasia hills; Behar; Burmah.
215. *Dendrobium cretaceum* *Lindl.*  
Distrib. Western Himalaya; Khasia hills; Kachin hills;  
Burmah.
216. *Dendrobium heterocarpum* *Wall.*  
Distrib. Nepal; Sikkim; Khasia hills; Assam; Burmah;  
South India; Ceylon.
217. *Dendrobium transparens* *Wall.*  
Distrib. North-Western Himalaya; Sikkim; Khasia hills;  
Garo hills; Assam; Kachin hills.
218. *Dendrobium crepidatum* *Lindl.*  
Distrib. Khasia hills; Assam; Burmah; West India.
219. *Dendrobium pendulum* *Roxb.*  
Distrib. Chittagong; Burmah; Siam.

220. *Dendrobium Devonianum* *Post.*  
Distrib. Bhotan ; Khasia Hills ; Naga Hills ; Assam ; Burmah.
221. *Dendrobium fimbriatum* *Hook.* var. *oculata.*  
Distrib. of species. North-West Himalaya ; Sikkim ; Khasia hills ; Manipur Burmah.
222. *Dendrobium Gibsoni* *Lindl.*  
Distrib. Sikkim ; Assam ; Khasia hills ; Burmah.
223. *Dendrobium chrysanthum* *Wall.*  
Distrib. Nepal ; Sikkim ; Khasia hills ; Shan hills ; Kachin hills.
224. *Dendrobium ocbreatum* *Lindl.* (No. 214).  
In flower. Fort Lungleh.  
Distrib. Naga hills ; Khasia hills ; Chittagong.
225. *Dendrobium aggregatum* *Roxb.*  
Distrib. Assam ; Burmah.
226. *Dendrobium chrysotoxum* *Lindl.* (No. 197).  
In flower. Fort Lungleh.  
Distrib. Burmah ; Assam.
227. *Bulbophyllum Lobbianum* *Lindl.* (No. 179).  
In flower. Fort Lungleh.  
Distrib. Burmah ; Siam ; Java.
228. *Cirrhopetalum picturatum* *G. Lodd.*  
Distrib. Burmah.
229. *Eria convallarioides* *Lindl.*  
Distrib. North-Western Himalaya ; Sikkim ; Khasia hills ; Naga hills ; Burmah.
230. *Eria pannea* *Lindl.*  
Distrib. Sikkim ; Khasia hills ; Kachin hills ; Burmah ; Malaya.
231. *Eria bambusifolia.* *Lindl.*  
Distrib. Sikkim ; Khasia hills ; Kachin hills ; Southern India.
232. *Eria tomentosa* *Hook. f.* (No. 228).  
In flower. Fort Lungleh.  
Distrib. Silhet ; Khasia hills ; Chittagong ; Burmah.
233. *Phajus maculatus* *Lindl.*  
Distrib. Nepal ; Sikkim ; Khasia hills ; Indo-China ; China ; Japan.
234. *Phajus albus* *Lindl.*  
Distrib. North-West Himalaya ; Nepal ; Sikkim ; Khasia hills ; Kachin hills ; Burmah ; Southern India ; Indo-China.

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235. *Cœlogyne Gardneriana Lindl.*  
Distrib. Himalaya ; Assam hills ; Karen hills.
236. *Cœlogyne graminifolia Par. and Reichb. f.*  
Distrib. Assam ; Tenasserim ; Kachin hills.
237. *Cœlogyne fuscescens Lindl.*  
Distrib. Nepal ; Sikkim ; Khasia hills.
238. *Cœlogyne ovalis Lindl.*  
Distrib. North-Western Himalaya ; Sikkim ; Khasia hills.
239. *Cœlogyne elata Lindl.*  
Distrib. North-Western Himalaya ; Nepal ; Sikkim ; Bhotan ;  
Assam ; Burmah.
240. *Cœlogyne maculata ? Lindl.*  
Distrib. Nepal ; Sikkim ; Bhotan ; Khasia hills.
241. *Pholidota imbricata Lindl.* (No. 229).  
Fort Lungleh.  
Distrib. Himalaya ; Assam ; Burmah ; Andamans.
242. *Pholidota advena ? Richb. f.*  
Distrib. Burmah.
243. *Pholidota Convallariæ Hook.f.* (No. 195).  
Fort Lungleh.  
Distrib. Khasia hills ; Naga hills ; Burmah.
244. *Pholidota rubra Lindl.*  
Distrib. Sikkim ; Khasia hills ; Kachin hills ; Upper Burma.
245. *Cymbidium lancifolium Hook.*  
Distrib. Nepal ; Sikkim ; Mishmi hills ; Khasia hills ; Indo-  
China, Japan ; Malaya.
246. *Cymbidium pendulum Swartz.*  
Distrib. Sikkim ; Bengal ; Assam ; Burmah ; Andamans ;  
Southern India ; Malaya.
247. *Phalænopsis Cornu cervi, Par. and Reichb. f.*  
Distrib. Burmah ; Malaya.
248. *Aerides Fieldingii Lodd.*  
Distrib. Sikkim ; Assam ; Kachin hills.
249. *Aerides odoratum Lour.*  
Distrib. Nepal ; Sikkim ; Khasia hills ; Silhet ; Chittagong ;  
Burmah ; South India ; Indo-China ; China ; Malaya.
250. *Renanthera Inschootiana Rolfe* (No. 230).  
Fort Lungleh.  
Distrib. Assam.

251. *Vanda teres* *Lindl.*  
Distrib. Bengal; Assam; Burmah; Andamans.
252. *Vanda cœrulea* *Griff.*  
Distrib. Khasia and Jyntea hills.
253. *Saccolabium papillosum* *Lindl.*  
Distrib. Eastern Himalaya; Assam; Lower Bengal; Burmah.
254. *Sarcanthus appendiculatus.* *Hook. f.*  
Distrib. Sikkim; Assam; Burmah.
255. *Cleisostoma bicuspidatum.* *Hook. f.*  
Distrib. Sikkim; Khasia; Tenasserim.
256. *Onithochilus fuscus.* *Wall.*  
Distrib. Sikkim; Bhotan; Khasia; Assam; Kachin hills;  
Burmah.
257. *Cypripedium villosum.* *Lindl.* var. *Boxalli.*  
Distrib. Shan hills; Kachin hills; Moulmein.

#### LXIV.—SCITAMINEÆ.

258. *Hemiorchis burmanica* *Kurz.* (No. 207).  
In flower. Between Ridge Camp and Lungsins. Alt. 2,000  
feet.  
Distrib. Khasia hills; Burmah.
259. *Hedychium villosum* *Wall.* (No. 120).  
In flower. Fort Lungleh.  
Distrib. Silhet; Assam; Khasia hills; Miki hills; Naga hills;  
Manipur; Burmah.
260. *Curcuma zedoaria* *Roscoe* (No. 206).  
In flower. Between Ridge Camp and Lungsins. Alt. 2,000  
feet.  
Distrib. Bengal; Khasia; Assam; Chittagong; South and  
Central India; Malaya.
261. *Amomum dealbatum* *Roxb.* (No. 173).  
In flower. Fifteen miles South-East of Lungleh. Alt. 3,000  
feet.  
Distrib. Sikkim; Bengal; Khasia hills; Silhet; Naga hills;  
Assam; Chittagong; Burmah.
262. *Alpinia malaccensis* *Roscoe* (No. 115).  
In flower. Fort Lungleh.  
Distrib. Sikkim; Khasia hills; Assam; Chittagong; Bur-  
mah; South India; Malaya.

## LXV.—AMARYLLIDÆÆ.

- 263.
- Curculigo recurvata Dryand.*
- (No. 218).

In flower. Fort Lungleh.

Distrib. Nepal; Sikkim; Bengal; Assam; Chittagong; Burmah; Ceylon; Malaya; China; Australia.

## LXVI.—DIOSCOREACEÆ.

- 264.
- Dioscorea glabra Roxb.*
- (No. 252).

In fruit. Demagiri. Alt. 500 feet.

Distrib. North-West Himalaya; Nepal; Sikkim; Bengal; Burmah; Malaya; South India.

- 265.
- Dioscorea bulbifera Linn.*
- (No.—).

Grown from a tuber gathered near Fort Lungleh.

## LXVII.—LILIACEÆ

- 266.
- Smilax lanceæfolia Roxb.*
- (No. 45).

In young fruit. Fort Lungleh.

Distrib. Sikkim; Khasia hills; Naga hills; Kachin hills; Manipur; Burmah.

- 267.
- Smilax Roxburghiana Wall.*
- (No. 149).

In fruit. Fifteen miles South-East of Lungleh. Alt. 3,000 feet.

Distrib. North-West Himalaya; Sikkim; Silhet; Cachar; Khasia hills; Kachin hills.

- 268.
- Dracæna ensifolia Wall.*
- (No. 144).

In flower. Fifteen miles South-East of Lungleh. Alt. 3,000 feet.

Distrib. Bhotan; Diphla hills; Silhet; Assam; Khasia hills; Naga hills; Kachin hills; Burmah.

- 269.
- Dracæna terniflora Roxb.*
- (No. 263).

In flower. Between Ridge Camp and Lungsin. Alt. 2,000 feet.

Distrib. Silhet; Cachar; Khasia hills; Manipur; Chittagong; South India.

## LXVIII.—COMMELINACEÆ.

- 270.
- Commelina nudiflora Linn.*
- (No. 264).

In flower. Between Linchong and Demagiri Alt. 500=1,000 feet.

Distrib. Cosmopolitan in the tropics.

## LXIX.—PALMEÆ.

271. *Pinanga gracilis* Bl. (Nos. 117 and 118).  
In fruit. Fort Lungleh.  
Distrib. Sikkim ; Bhotan ; Khasia hills ; Assam ; Chittagong ;  
Burmah.
272. *Caryota urens* Roxb. (No. 56).  
In leaf only. Fort Lungleh.  
Distrib. Throughout the hotter parts of Asia.
273. *Licuala peltata* Roxb. (No. 262).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Khasia ; Assam ; Silhet ; Burmah ;  
Andamans.
274. *Calamus tenuis* Roxb. (No. 261).  
In leaf only. Fort Lungleh.  
Distrib. Tropical Himalaya ; Bengal ; Assam ; Silhet ; Chittagong ; Burmah ; Indo-China.

## LXX.—AROIDEÆ.

275. *Steudnera* sp. (No. 267).  
In flower. Between Ridge Camp and Lungsins. Alt. 1,000 feet.
276. *Alocasia fallax* Schott (No. 50).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Khasia hills ; Burmah.
277. *Rhaphidophora calophyllum* Schott (No. 15).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Khasia hills ; Burmah.
278. *Rhaphidophora Hookeri* Schott (No. 67).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Duphla hills ; Khasia hills ; Garo hills ;  
Chittagong ; Manipur ; Upper Burmah.
279. *Rhaphidophora glauca* Schott (No. 266).  
In flower. Fort Lungleh.  
Distrib. Nepal ; Sikkim ; Bhotan ; Duphla hills ; Khasia hills ;  
Naga hills ; Manipur.
280. *Rhaphidophora decursiva* Schott (No. 68).  
In flower. Fort Lungleh.  
Distrib. Sikkim ; Khasia hills ; Upper Burmah ; South India ;  
Ceylon.

281. *Pothos scandens* *Linn.* (No. 265).  
In flower. Helio hills, Lungleh. Alt. 3,700 feet.  
Distrib. India; Indo China; Malaya; China.
282. *Pothos Cathcarti* *Schott* (No. 83).  
In flower. Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Naga hills; Assam;  
Kachin hills; Burmah.

## LXXI.—CYPERACEÆ.

283. *Kyllinga monocephala* *Rottb.* (No. 278).  
Between Lungleh and Ridge Camp. Alt. 3,000 feet.  
Distrib. Throughout India and the Old World tropics.
284. *Cyperus diffusus* *Vahl.* (No. 167).  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Throughout the tropics.
285. *Scleria sumatrensis* *Retz.* (No. —).  
Between Ridge Camp and Lungsins. Alt. 2,000-3,000 feet.  
Distrib. Bengal; Chittagong hill tracts; South India  
Ceylon; Malaya; Nicobars; Java.

## LXXII.—GRAMINEÆ

The following species are only those which have been as yet worked out from the collection, and do not represent it completely:—

286. *Panicum sarmentosum* *Roxb.* (No. 156).  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Assam; Silhet; Cachar; Khasia; Chittagong;  
Burmah; Indo-China; China.
287. *Panicum plicatum* *Lamk.* (No. 279)  
Between Lungleh and Ridge Camp. Alt. 3,000 feet.  
Distrib. North-Western Himalaya; Sikkim; Shan hills;  
South India; Ceylon; Malaya; China.
288. *Panicum pilipes* *Nees. and Arnott.* (No. 133).  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Sikkim Terai; Khasia hills; Burmah; Central and  
South India; Ceylon; Nicobars; Malaya; Indo-China;  
Madagascar; Australia.

289. *Thysanolaena agrostis* *Nees*. (No. 281).  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. North-Western Himalaya; Sikkim; Khasia hills;  
Behar; South India; Burmah; Nicobars; Malaya.
290. *Imperata arundinacea* *Cyrrill*. (No. 208).  
Between Ridge Camp and Lungsins. Alt. 2,500 feet.  
Distrib. Cosmopolitan in the tropics.
291. *Pogonatherum crinitum* *Trin.* (No. 280).  
Between Ridge Camp and Lungsins. Alt. 2,500 feet.  
Distrib. Throughout India and Malaya; China; New  
Hebrides.

## LXXIII.—LYCOPODIACEÆ.

292. *Lycopodium setaceum* *Ham.*  
Fort Lungleh.  
Distrib. Himalayas; Nilgherries; Ceylon; Borneo.

## LXXIV.—SELAGINELLACEÆ.

293. *Selaginella caulescens* *Spreng.*  
Between Ridge Camp and Lungsins. Alt. 2,000 feet.  
Distrib. India; Ceylon; Indo-China; Malaya; China;  
Japan; Philippines; New Guinea.
294. *Selaginella Wallichii* *Spreng.*  
Between Ridge Camp and Lungsins. Alt. 2,000 feet.  
Distrib. Eastern Himalaya; Malaya; Philippines; New  
Guinea.

## LXXV.—FILICES.

295. *Davallia polypodioides* *Don.* var. *strigosa* of C. B. Clarke's  
Ferns of Northern India  
Fort Lungleh.  
Distrib. North-West Himalaya; Nepal; Sikkim; Khasia;  
Chittagong; Assam; South India; Malaya; China; Japan;  
Polynesia; Tropical America.
296. *Onychium auratum* *Kaulf.*  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Assam; Chittagong; Malaya.
297. *Pteris quadriaurita* *Retz.*  
Fort Lungleh.  
Distrib. Punjab; Assam; Chittagong; South and West  
India; Ceylon; Malaya.

298. *Pteris biaurita* *Linn.*  
Fort Lungleh.  
Distrib. North-West Himalaya; Sikkim; Khasia; South and West India; Ceylon; Malaya; China; Tropical Africa and America.
299. *Blechnum orientale* *Linn.*  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Khasia hills; Chittagong; South India; Ceylon; Malaya; China; Polynesia; Australia.
300. *Asplenium Nidus* *Linn.*  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Assam; Chittagong; South India; Ceylon; Malaya; Polynesia.
301. *Asplenium bantamense* *Baker.*  
Fifteen miles.  
South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Khasia; Cachar; Chittagong; South India; Malaya; China.
302. *Asplenium sylvaticum* *Presl.*  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Burmah; Malaya; South India; Ceylon; Mauritius.
303. *Asplenium multicaudatum* *Wall.*  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Bhotan; Khasia; Chittagong.
304. *Didymochlæna lunulata* *Desv.*  
Fort Lungleh.  
Distrib. Assam; Burmah; Malaya. The discovery of this fern goes to show that the doubt thrown upon the authenticity of Jenkin's Assam specimens in the Calcutta Herbarium, is not well founded.
305. *Nephrodium glandulosum* *J. Sm.*  
Fort Lungleh.  
Distrib. North-Western Himalaya; Assam; Chittagong; Burmah; Malaya; Philippines.
306. *Nephrodium molle* *Desv.*  
Fort Lungleh.  
Distrib. Himalaya; Chittagong; Burmah; Malaya; South and West India; Africa; South America; West Indies; Australia.

- 
307. *Nephrodium parasiticum*, *C. B. Clarke*.  
Fort Lungleh.  
Distrib. Throughout India.
308. *Nephrodium vastum* *Baker*.  
Between Lungleh and Tuichong. Alt. 2,000-3,000 feet.  
Distrib. East Bengal; Mishmi; Khasia; Chittagong;  
Burmah; Malaya.
309. *Polypodium urophyllum* *Wall*.  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. North-Western Himalaya; Sikkim; Bhotan; Chittagong; South India; Ceylon; Malaya; North Australia; Polynesia.
310. *Polypodium multilineatum* *Wall*.  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. North-Western Himalaya; Sikkim; Chittagong; South India; Malaya.
311. *Polypodium Heteractis* *Mett*.  
Helio hill, Lungleh. Alt. 3,700 feet.  
Distrib. Sikkim; Bhotan; Khasia.
312. *Polypodium quercifolium* *Linn*.  
Fort Lungleh.  
Distrib. Throughout India; Malaya; South China; Australia.
313. *Polypodium normale* *Don*.  
Fifteen miles South-East of Lungleh. Alt. 3,000 feet.  
Distrib. Nepal; Sikkim; Bhotan; Khasia hills.
314. *Polypodium hemionitideum* *Wall*.  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Bhotan; Khasia; Chittagong; South India; Malaya; China.
315. *Acrostichum virens* *Wall*.  
Fort Lungleh.  
Distrib. Chittagong hill tracts.
316. *Lygodium pinnatifidum* *Sw*.  
Fort Lungleh.  
Distrib. North-Western Himalaya; Nepal; Sikkim; Silhet; Khasia hills; Assam; Kachin hills; Chittagong and Burmah; South and Western India; Andamans; Malaya.
317. *Angiopteris evecta* *Hoffm*.  
Fort Lungleh.  
Distrib. Nepal; Sikkim; Bhotan; Chittagong; South India; Ceylon; Malaya; Australia; Madagascar.

The following table gives a synoptic view of the systematic character of the collection :—

Phanerogams . .			72		215		291
Dicotyledons . .		62			171		208
Polypetalæ . .	33			73		87	
Thalamifloræ . .	13		21		22		
Discifloræ . .	8		19		24		
Calycifloræ . .	12		33		41		
Gamopetalæ . .		9		63		78	
Incompletæ . .		10		35		43	
Monocotyledons . .			10		44		83
Cryptogams . .			3		13		26
TOTALS .	Nat.	orders	75	Genera	228	Species	317

Amongst the Phanerogams the Natural order Orchidaceæ comes first with 49 species, next Filices with 23 species, Leguminosæ with 18 species, Urticacæ with 15 species, Rubaceæ with 14, Euphorbiaceæ with 13 species, Acanthaceæ with 11 species, Compositæ with 10 species. Of the remainder there are one order with 8 species, one with 7 species, ten with 6 species, three with 5 species, nine with 4 species, ten with 3 species, thirteen with 2 species, twenty-eight with 1 species.



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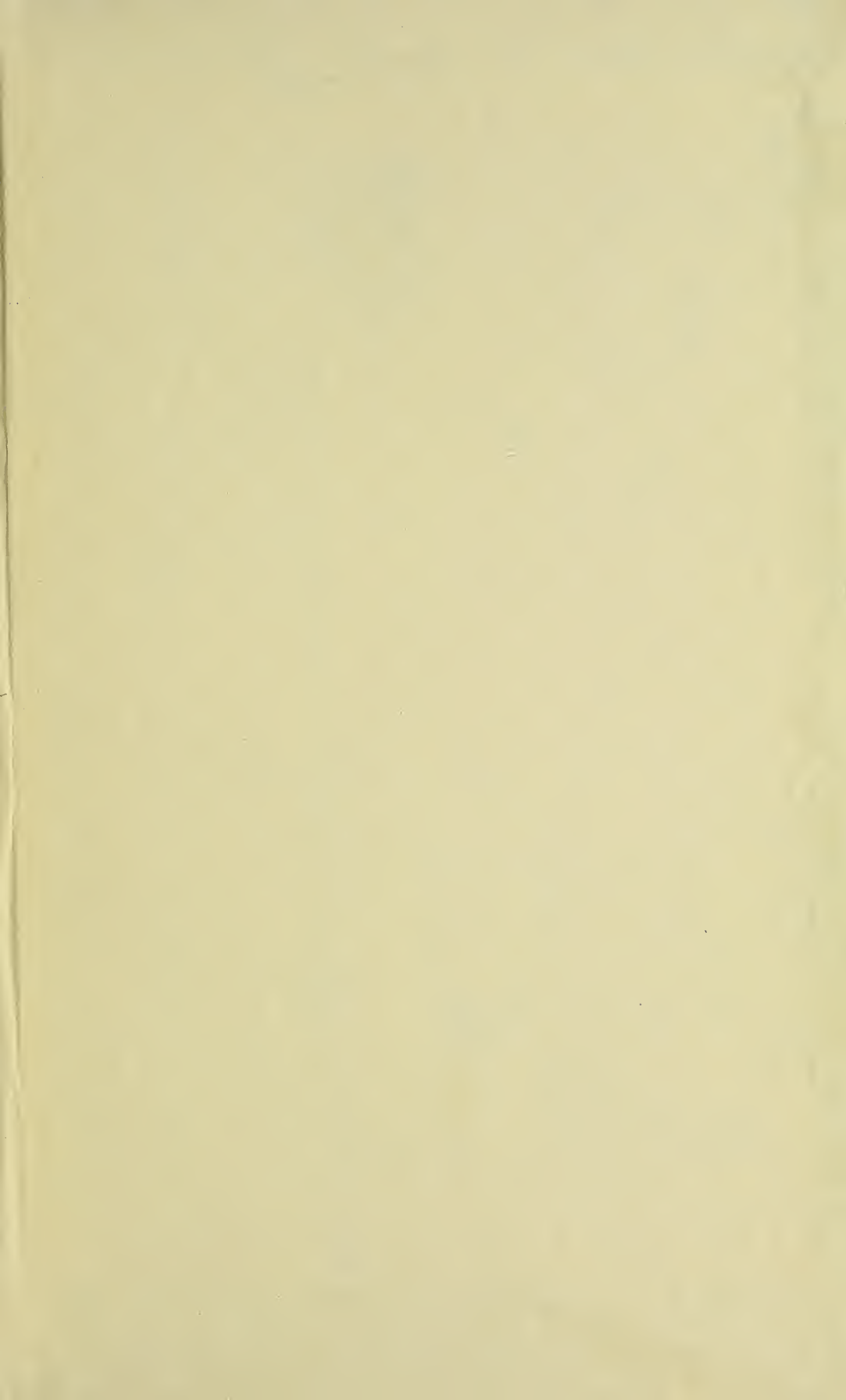
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